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Contents

	PAGE
Editorials:	
The Steel Situation	1141
Utah Consolidated	1142
The Lead Market	1142
The Calamine of Leadville	1142
Correspondence and Discussion: Coöperation between the United States Geological Survey and the Bureau of Mines....The Buddle as a Concentrator of Copper Slimes....Mining and Smelting in Colorado....The Value of Observation....The Necessity for Free Silica in Pyrite Smelting....Tunneling Machines....The Best Material for Stamp-mill Parts	1143
Questions and Answers	1145
Details of Practical Mining: *A Simple Sampling Device....*Whitford-Mills Skip Loading Device....Insulation of Electric Cables....Diamond Drill Reports....The Treatment of Overblown Charges in Copper Converters....*A Concrete Pipe Conduit....*Types of Skip Dumps in New York Iron Mines	1146
The Copper Situation	1150
Utah Consolidated	1150
Inspiration Copper Company	1152
Report of Montana-Tonopah Mining Company	1153
Copper Castings of High Conductivity	1154
*A New Baldwin Electric Locomotive	1154
Postal Banks for Mining Camps	1154
New Map of a California Oilfield	1154
*The Antigua Mines of Real de Sivirijoa, Sinaloa.....*E. A. H. Tays*	1155
Zacatecas and Orient Railroad Concession	1156
Protecting Investors by Exposing Mining Frauds.....*C. S. Thomas, Jr.*	1157
The Coöperative Smelting Works at Johannesburg	1160
*Club Houses for Mine Employees	1160
Value of Geological Work in Limestone Regions.....*Claude T. Rice*	1161
*The Multiple Tube Mill	1163
Water Power in Northern Ontario	1163
A Process for Saving Wastes in Smeltery Gases.....*George C. Westby*	1164
*Extension of a Colliery Working Shaft.....*M. S. Hachita*	1168
Evidence Concerning the Starkville Mine Explosion...*Special Correspondence*	1170
French View of American Railway Haulage	1170
Must Extract All the Coal or Pay Damages...*Special Correspondence*	1170
Mine Explosion in Kentucky	1170
*Repair Work in Colliery Practice. *James A. Seager*	1171
Personal, Obituary and Societies	1173
Editorial Correspondence	1174
Mining News	1176
Markets	1182

**Illustrated.*

The Steel Situation

The conference of steel makers which was in session last week when our reports were closed, was concluded without any definite action; at least no positive statement of such action was given out. It appears, however, that a sort of general agreement was reached that prices of finished steel ought to be maintained at about the present level; and that no general reductions should be made for the purpose of stimulating business. A peculiarity of their decision is that it seems to have been reached chiefly by the larger independent companies. The Steel Corporation presented or assumed no definite leadership; and indeed it has been reported that there are serious differences of opinion among the heads of the Corporation itself.

In some respects the situation into which the market has drifted resembles that in which it was before the open market declaration of February, 1909, which gave such a noteworthy stimulus to trade. That followed a long period during which prices had been maintained with a good deal of pomp and circumstance. It was also preceded by more or less cutting and shading of prices by the smaller independent companies; sufficient in amount to show the possibilities of extended business, and to make the larger independents and the Corporation itself a trifle uneasy. It followed a longer period of dullness and small sales than has been passed through this year; and the level of prices was generally higher than that prevailing during the half-year now closing.

With these exceptions the situations in February, 1909, and December, 1910, are not unlike. Continued depression in the financial markets has had its effect on trade, and there is more or less reluctance to undertake new enterprises, unless some special reason—such as the cheapness of material—is presented. To what extent the inducement of low prices would operate is not altogether clear. There is no doubt that it would have some effect, but just how much it is more difficult to foresee now than it was two years ago. It seems sure, however, that the experiment is worth trying.

At present, according to the best attainable information, the Steel Corporation and the larger independent companies are running at about 60 per cent. of their present capacity. This does not mean that there is not still a large volume of business—larger, indeed, than at any time prior to the active period of 1906. The extensions and additions to mills and furnaces that were started during the boom of 1906-7 are now mainly finished. Our producing capacity is now from 25 to 30 per cent. greater than it was early in 1906. The present rate of production and sales would have kept active much more than four-fifths of the capacity of four years ago. No small part of the present apparent dullness is due to the fact that productive capacity has grown faster than the ability to consume. Time is required to even up, and until this has been done there will be more or less complaint of dull markets.

The present situation, however, can be improved. As in all trades the buyer can be led, if he thinks he sees an opportun-

ity for his own advantage; and the wise trader offers inducements if he can.

Utah Consolidated

This year of 1910 has been remarkable for the collapse of bubbles. Without considering the inflated prospects that have exploded we have witnessed revelations with respect to such mines as the Granby, North Butte, and the Last Chance and Morning of the Federal company that have led to precipitous declines in their shares To this list has now been added the Utah Consolidated, which it is to be hoped will complete the disastrous and discreditable record of this year.

The Highland Boy mine, of the Utah Consolidated, long since outlived its halcyon days and has been on the downward grade for several years. However, no one supposed that its condition was so bad as now appears. The facts in connection with the recent disclosure are quite different from those in the surprises sprung upon the stockholders of Granby and North Butte. In the case of Utah Consolidated we have no preachment to make, nor any disagreeable remarks.

This company has been under an expert and intelligent management. It has been for many years characterized by the excellence of its reports, in which among other things the ore reserves at the end of each year have been regularly stated. So recently as last winter the management took the trouble to confirm its own estimate by the report of an independent consulting engineer. The relations between the directors and their stockholders were unexceptionable.

Recently, Mr. Risque, who succeeded R. H. Channing, Jr., about four years ago, retired from the management, which passed again into the hands of Mr. Channing, as directing engineer. Mr. Channing undertook a redetermination of the ore reserves and found them to be only 300,000 tons, averaging 2.32 per cent. copper, 0.5 oz. gold and 0.85 oz. silver, besides 100,000 to 250,000 inaccessible for inspection on account of caves and fills of waste, but probably extractable. This estimate was confirmed by an independent engineer, whose services were wisely employed, in view of the surprising character of these figures. Mr. Risque had reported 1,237,470 tons, last February; while Mr. Finch had reported 1,121,360 tons, averaging 2.33 per cent. copper. Since then up to Dec. 1 only 130,000 tons have been extracted.

What is to be said of this except that one of the two parties of engineers blundered? In this connection we must commend the correct procedure of Mr. Broughton, the president of the company, in bringing all of the engineers together for consultation, explanations, etc., before coming to the conclusion that he was bound to announce. His announcement, moreover, was evidently made as promptly as possible.

The upshot is that we now find this once-famous mine left with only one year's supply of known ore, possibly enough for six months more, and some fair chances for new discoveries, while a great smelting works, especially installed for the treatment of the product of this mine, has but just been completed.

The Lead Market

The situation in the lead market is the great mystery of all of the metal markets. This follows naturally from the fact that the statistics for this metal are decidedly inferior to those for copper, spelter and tin, and even to those for pig iron. We never know accurately with respect to the accumulated stocks. The production of lead for several years has been ample in spite of the decline of some of the important mines, the undisputed statement that no new lead-producing district has been discovered in 20 years, and the prognostication that some of the present producers will go off rapidly before the lapse of many years. Up to date, however, the decrease in the production of the Cœur d'Alene, which district has doubtless passed its zenith, has been more than made good by Missouri. For several years it appears likely that the production of the United States has been in excess of the consumption, leading to a large accumulation of stock. At the end of 1910 this stock will probably be smaller than at the beginning, but we suspect that it is still larger than is generally believed which, if true, may, along with some other circumstances, account for some of the peculiarities that have been observed in this market during the year.

The Calamine of Leadville

We doubt if the exuberant estimate of a body of calamine ore amounting to 1,215,000 tons, averaging 37½ per cent. zinc, and possessing a net value of $19,440,000 will be realized; or that by the end of this year, now so close at hand, the shipments of calamine from Leadville will be at the rate of 10,000 tons per month. The actualities are likely to be less in each case. However, the newly discovered deposits are undoubtedly of much commercial importance, even if their extent be smaller, their occurrence more irregular and their grade lower than enthusiasts have proclaimed. And, moreover, their importance will not be confined merely to the miners who will realize upon them and the smelters who will gain a needed new supply of raw material, but will extend to the whole State of Colorado, of which the mining industry in general will benefit by the promotion of the idea that its old mines may still have something worth prospecting for.

One of the most interesting instances of the revival of an ancient mining industry is found in France. Gold was mined there in Roman times, and to some extent in the middle ages; but only a few years ago there was no idea that the ancient mines would ever be reopened. Through the persistent effort of a few engineers and metallurgists, however, it has been done; and last year there was a total production of 1800 kg.—or nearly $1,200,000—in gold, and a considerable profit was reported by the companies engaged in the work. There is every prospect also that this output will show an increase for the current year.

West Virginia in the last fiscal year increased its coal production largely. A still further increase is planned, for there has been for some months past a real boom in the coal lands of the State. Some important transfers have been made and the number of new companies organized is large. Some of these, at least, mean business and have substantial backing. Iit is noticeable that a number of Pennsylvania operators are securing West Virginia lands, either for immediate opening or to be held as a reserve for the future.

CORRESPONDENCE and DISCUSSION

Views, Suggestions and Experiences of Readers

Cooperation between the United States Geological Survey and the Bureau of Mines

On my return to Washington I note the statement made in the Nov. 19 issue of the JOURNAL asserting lack of coöperation between the U. S. Geological Survey and the Bureau of Mines. Director Holmes has already informed you of the lack of foundation for that statement, so that I need add only a word of corroboration.

With the permission of Doctor Holmes I quote from a letter I wrote him in September in which I mentioned coöperation between the two bureaus, "that must touch at many points if their work is to be successful" and which I concluded with this sentence: "I hope you will consider this letter a sincere expression of my desire and purpose to make every effort to contribute to the success of yourself and your bureau." To bring about such active coöperation the directors, as well as the other members of the two bureaus, are in frequent conference.

In asking you to correct the wrong impression occasioned by the statement of your Washington correspondent, I wish to express my appreciation of the fact that for some months Washington has been very dull as a news center.

GEORGE OTIS SMITH,
Director, U. S. Geological Survey.
Washington, D. C., Nov. 30, 1910.

The Buddle as a Concentrator of Copper Slimes

Mr. Rice, in his article published on page 1107 of the JOURNAL of Dec. 3, makes several rather daring statements. It has always been my understanding that the buddle with a concave conical surface gives rapid rough concentration; with a convex surface, a slower concentration, but a higher saving and consequently tailings of lower grade. In fact I have seen a concave buddle used first to give a rough concentrate product that was later cleaned on a convex buddle. The Pinder concentrator is, I believe, built in both forms by the Joshua Hendy Machine Works of San Francisco.

In the North Star mills, at Grass Valley, Cal., nine Dodd buddles are used in each of the two plants. The machines do not make a clean concentrate and in each installation the middlings from the first eight tables are treated on the ninth. This is, of course, not an example of the treatment of copper slimes, but of the rough concentration of gold-bearing sulphurets. However, certainly no one can charge the North Star metallurgists with "fossilhood" and in any general discussion of the pros and cons of the buddle those gentlemen should be heard from.

S. CALLEY.
Colorado City, Colo., Dec. 5, 1910.

Mining and Smelting in Colorado

I have long held the opinion that the newspapers are in large measure indirectly responsible for the decrease of mining in Colorado. It is high time that the local press put the soft pedal on their ridiculous statements, for owing to these well known exaggerations and misleading statements, they are fast drifting into the condition of the boy who cried, "Wolf!" for fun when there was no wolf; then when the latter really came, the boy's cries were unheeded, and Lupus made a comfortable repast. Of course, local editors are anxious to help their particular district, and their efforts in this behalf are laudable; moreover, they cannot afford to employ a mining engineer to give correct reports, and they themselves have had no technical education. The consequence is that they simply publish what the miners tell them. But all editors in mining camps know enough about the business to exercise more discretion in what they publish.

What happens is this: Three partners are working their claim, and a shot in the breast discloses some rich ore. A picked sample is at once taken, and rushed to the assay office. It may show some free gold or the telluride of gold, such as sylvanite or calaverite, and the assay returns say 50 oz. gold to the ton. Then the local reporter gets hold of the story, and an article appears next issue as follows: "——— and associates have just broken into a body of ore that assays better than (mind you, it is always 'better than') 50 oz. gold per ton. The extent of the orebody has not yet been determined, but the partners are very jubilant over their good fortune."

Meantime the men have put in some more shots, and find they have say 3 ft. of ore that will average $15, the first shot having been in a rich pocket. Or if the reporter visits the lease, he is told that they have just shipped a carload to the smeltery, and it "ought to go at least $100 to the ton." In the paper next issue this item reads: "They are making regular shipments, and a carload of ore has just gone to the smeltery, which will yield better than $100 to the ton in gold."

Would it not be better for the reporter to have waited until the smeltery returns were received, and then published actual facts? These vagaries are copied from the local mining papers into the Denver dailies, and read by perhaps 100,000 people, more or less. But the public is now thoroughly "onto the game," and the reports benefit neither the camps, the mine owners, nor the papers, and it is high time that the editors and news gatherers begin to cut out the publishing of prophecies, assays of picked specimens, and estimates of the value of ore from appearances, and the interests of the mining industry of Colorado, will thus be better served.

W. W. ORSON.
Denver, Colo., Dec. 1, 1910.

The Value of Observation

The man holding an operating position in the mining industry is usually given slight consideration by American companies. It is required that he "deliver the goods" and the means by which this be accomplished are left entirely to the individual. The shortsightedness of such a policy is certainly evident to the operator, but is seldom considered by company officials.

Any man, no matter how thorough his training and wide his experience, is liable to get into a rut after remaining on one job for a number of years without interruption. The cares and worries of the routine work on any large operation are enough to keep the superintendent or manager engrossed in his own peculiar duties and after a certain period he is bound to lose his perspective. Meanwhile problems of mining practice and metallurgy are being worked out elsewhere but the man with "his nose to the grindstone" has little or no opportunity to keep posted on these advances.

True, the JOURNAL, in the columns devoted to practical mining and in the longer general articles, chronicles the work of various operators all over the world. But it is hard for the average reader to realize the importance of these ideas and to see how they can profitably be applied to his own problems. On the other hand if each man could personally

inspect the new workings he could at once appreciate the possibilities for improving his own operations by the application of the ideas involved.

It seems to me that the best way to keep my own work up to the standard of other communities is to visit these from time to time and judge of the value of the other fellow's ideas. A number of the large English mining companies have for a long time made a practice of sending their superintendents and other employees, at certain intervals, on trips of inspection to other mining districts. The result has been, I believe, most satisfactory to the company and the employee.

In recent years several of the large American companies have adopted this scheme to a limited extent. The fact that the operations of such companies are carried on in the most economical manner should prove the wisdom of such a course.

More often, however, if a superintendent is a man of large enough caliber to realize the need of outside observation and ideas, he must himself not only stand the expense of his trip but make it on his own time. (Vacations are almost unknown to the average mining operator.) The fact that the benefit from such trips accrues entirely to the company is seldom realized.

Should such a practice of visiting among mining men once obtain, the companies would quickly be brought to the realization of the benefit to be derived and, in order that their representatives be accorded opportunities for observation, would be forced to be more open in allowing others access to their workings.

The initiative in such a move must, however, be taken by the companies and not by their employees. A free interchange of ideas and consideration for the employee "on the job" is the desideratum both from the viewpoint of the shareholder and the operator.

SUPERINTENDENT.

Clifton, Ariz., Nov. 20, 1910.

The Necessity for Free Silica in Pyritic Smelting

In the JOURNAL of Dec. 3, 1910, there is an abstract of a report on pyritic smelting at the Famatina plant, in which the conclusion is reported that "in pyritic smelting it is absolutely necessary that the silica should not be combined, but be free to combine at once with the iron oxide as soon as formed by the oxidation of the pyrites." However, in this particular case the ore contained 11.5 to 15.3 per cent. of alumina, and I am inclined to believe that absent alumina would be more of a desideratum in this case than free silica. That is, I believe that a mixture of quartz, iron pyrites and hercynite (ferrous aluminate) would give the same difficulties that the Famatina company encountered, although in this case it is clear that the silica would be free, and the alumina already combined.

BLAST FURNACE.

Copper Hill, Tenn., Dec. 7, 1910.

Tunneling Machines

For several years I have been watching, through the technical press, the advance in the development of tunneling machines and during this time have examined several of the machines. It is my opinion that a mechanically satisfactory tunneler would possess great advantages, as a rapid rate of advance could be attained at a probable lower cost than is possible by ordinary present-day methods, and the most desirable form of tunnel could be cut in one operation. The successful solution of the mechanical problems of the construction is, however, yet to be found.

I remember witnessing the test of the Terry, Tench & Proctor machine which was conducted in the New York Central excavation near Forty-sixth street, New York, on June 3, 1909. The machine ran practically without a hitch for 10 min., during which period it advanced an 8-ft. heading 3½ in. The only difficulty seemed to be in getting the drills to cut the outer rim of the heading as fast as the central portion was advanced. However, after a few days of unsuccessful tinkering the machine was loaded on flat cars and removed to a place where the necessary changes could be made to better advantage.

Since that time I have at infrequent intervals heard rumors of the tunneler being perfected but have never heard of a successful run. And this machine impressed me as being the best of the machines I had seen.

Then, last spring, while going through the Original Consolidated mine at Butte, Mont., I unexpectedly came across a most wonderful monster of the underworld which upon closer inspection proved to be a tunneler of very much the same design of the Proctor machine. This Butte tunneler was designed by Thomas Bryant, superintendent of the Original Consolidated, and although much time, energy and probably money had been spent on its perfection it had, to say the least, failed to "eat its way through the granite" as is often claimed for the various tunnelers.

From time to time the Karns, Sigafoos and Granger tunneling machines, and one recently invented by William Forbes Wittick, of Erie, Penn., have attracted attention either through newspaper reports of great doings or stock advertisements. So far, however, I have been unable to run down a single case of successful operation over any considerable period of time.

I certainly agree, though, to the advantages of a "successful" tunneling machine and only wait to be shown the machine in which the numerous mechanical difficulties have been overcome. It is manifestly impossible to learn through the ordinary channels of all the advances in this or any other line, and I consider the subject of sufficient interest to mining men to start the discussion, hoping that those who have later and more accurate data will submit them through the columns of the JOURNAL.

J. T.

New York, Dec. 4, 1910.

The Best Material for Stamp-mill Parts

During my experience in various stamp mills in the West, I have had occasion to use several kinds of material for stamp-mill parts. Gradually I have formed an opinion as to the most suitable material for each part, but I admit that I have not collected accurate or complete data to support my opinions. It is in the hope of starting a discussion that will be fruitful in bringing out interesting information on this subject, that I am willing to venture into print with such an unsatisfactory treatment of the subject.

For stamp shoes and dies I have formed a strong preference for chrome steel, although the hammered armor plate and cast-projectile steels, such as advocated by the Midvale company, seem to give almost as satisfactory results. I have also used the manganese steel, but it seems to exhibit a tendency to flow under the hard usage to which it is necessarily subjected. Shoes of cast iron I consider a nuisance, as there is always strong chance of cracking in the neck. Cast-iron dies are, however, much better, and I have at various times secured white-iron dies from local foundries that gave excellent service.

I also advocate the use of steel stamp heads, tappets and cams as being more economical and satisfactory in the long run. One broken part means the hanging up of an entire battery and the loss thus entailed will, in a short time, more than overbalance the saving effected in buying a cheap grade of cast-iron parts. Stamp heads, etc., should be made of specially selected open-hearth steel that has been treated and annealed.

After operating a mill for a long period using cast-iron stamp-mill parts, it will usually cause an awful "halloo" from the office when steel parts are requested. I have found, though, that the results attained using the more expensive steel parts have been so satisfactory that the after effect on the office gentlemen has been pleasing enough to warrant the first unpleasantness.

A. Z. RANDALL.

Virginia City, Nev., Nov. 20, 1910.

? QUESTIONS and ANSWERS ●

Effect of Molybdenite in Cyanide Practice

Can you give me any information as to the effect of molybdenite in an ore to be treated by the cyanide process?

MOLYBDENUM.

It is probable that the molybdenite would have no effect whatever, especially if in small quantities, i.e., only 1 or 2 per cent. It any readers have had experience with high percentages of molybdenite in cyaniding ores, in which positive effects were shown, information concerning them would be greatly appreciated.

Disposal of Titanite

Can you advise the names of the users of titanite, and the price paid for it?

H. M. N.

The only suggestion which we can make on the subject of users of titanite, is that you write to the Titanium Alloy Manufacturing Company, of Pittsburg, Penn.; C. W. Leavitt & Co., E. V. Machette, or the Goldschmidt Thermit Company, of New York. The prices of the less commonly used minerals is dependent to a large extent on the purity and quantity of material offered, and sometimes on whether or not the new producer is thought sufficiently powerful to make it worth while to make an ally of him, so that any general price quotations would be meaningless, although it may be safely stated that a 100 per cent. rutile will not bring much over 40 cents per unit at New York.

Soldering Aluminum

Please state whether there is any method for soldering aluminum?

W. S. A.

The difficulty in soldering aluminum consists chiefly in the quick formation of an oxide film, which cannot be removed by soldering salts as with other metals. However, with practice, aluminum can usually be soldered by rubbing the solder stick back and forth over the surface hard enough to remove the oxide film, at the same time heating with a blow torch. This coats the metal with solder as fast as the oxide is rubbed off. A blow torch rather than a soldering iron is used so as to attain a high enough temperature for solder and aluminum to alloy. After "tinning" for some time it is well to rub the solder into the surface with a brass scratch brush while the solder is still fluid, after which it may be necessary to retin.

The best aluminum solder is composed of lead and zinc in various proportions. An obstacle to attaining the high temperature spoken of as necessary for soldering aluminum is the high heat conductivity of the metal, so anything which can be done to prevent radiation, conduction and convection losses is a help in the soldering process.

The Magnetometer

Can you tell me where I can get a Thalén-Tiberg magnetometer and is it a good indicator of mineral? If a mineral compass shows a dip of 40 to 45 deg. anywhere on a twenty-acre tract of land, what does this indicate? J. E. W.

The apparatus referred to can be obtained of Hamilton & Hansell, 29 Broadway, New York, at about $125. It is a good indicator for strongly magnetic minerals, but not for magnetically inert orebodies. As to the meaning of a 40- to 45-deg. dip on a piece of property, that would depend entirely on the prevailing magnetic dip for that locality. The average dip for that vicinity could be obtained from the Geological Survey, or you could test it for yourself. If 40 to 45 is decidedly greater than the prevailing dip, it seems undoubted that a body of iron ore must underlie that field.

Copper Smelting with Charcoal

I want to look into the method of smelting copper ore with charcoal in a water-jacket furnace. What book is there on the manufacture of charcoal in beehive ovens, including construction of the ovens? What book or paper is there respecting the smelting with charcoal in water-jacket furnaces? Is anyone using that fuel for such smelting at the present time?

C. C.

(1) We know of no book or paper on the manufacture of charcoal. The subject is covered more or less extensively in all the books on fuel. See Mills and Rowan, "Fuels and Their Applications," price $5.

(2) We know of no book or paper on the smelting of copper ore with charcoal. Such smelting has been done by many persons, including the editor of this paper. There is no difficulty about it. Go ahead and do it, but do not use so high a burden of charge as to crush the charcoal excessively.

(3) We do not know of anyone using charcoal as fuel at the present time, but have no doubt that there are small furnaces running in Mexico with that fuel.

Sampling Copper by Granulation

What is the probable source of error introduced by sampling converter charges by a ladle sample granulated into water.

H. J. P.

The difficulty with the above method of sampling is that more or less copper always solidifies on the ladle during the pouring. This copper will, except in rare cases, have a lower value than the unchilled metal, making the copper poured from the ladle of higher silver and gold tenor than the average of the charge. The difference between a ladle sample taken this way and the true average of the charge may amount to 5 or 6 per cent. of the silver contents, and can hardly fail to be less than 1 per cent. If the ladle be strongly heated before taking the sample, the segregation is diminished, and the accuracy increased, but the results are not reliable even then, and the only safe way is to take a shot sample by batting through the falling stream with a wooden paddle and catching the shot in water.

A method sometimes practised is to cast a thin rectangular cake, and to saw it along the diagonals. This method is also faulty, for the cake itself will average too high if it is cast from a ladle, while even if the cake be a fair average, sawing along the diagonals gives too high a result. If a cake sample be taken, first be sure that it is a fair sample of the falling stream, and then drill holes well distributed over its surface, and going all the way through the plate.

Use of Holes in Powder

Can you tell me the use of the holes through the prisms of high-power powder? M. F. H.

According to information furnished by Doctor Hudson, of the du Pont de Nemours company, these powders are not high-power in the sense that they explode quickly as do the high explosives used in blasting. The reason for the holes, according to Doctor Hudson, is as follows: These coarse powders burn with comparative slowness from the surface only, instead of going off practically all at once, by detonation throughout the mass, as do some of the high explosives. If the powder in a cannon burned only from the outside of the grain, the surface available for combustion would continually grow smaller, and the volume of gas generated in equal infinitesimal portions of time grow continually less, whereas the demand for the propelling force is growing continuously greater. By putting the holes through the powder, inner combustion surfaces are provided which grow continuously greater as the material burns away. Usually there are seven of these holes provided to counterbalance the one large outside surface. Doctor Hudson also made the interesting statement that the powders for large-caliber arms were intentionally calculated to burn the carbon only to CO, as the high temperature produced by burning to CO_2 eroded the gun too much, but that in revolver powders, where the powder practically got nothing but one quick push at the bullet, the oxygen was calculated to burn the carbon to CO_2 in order to develop a high temperature, and consequent high pressure.

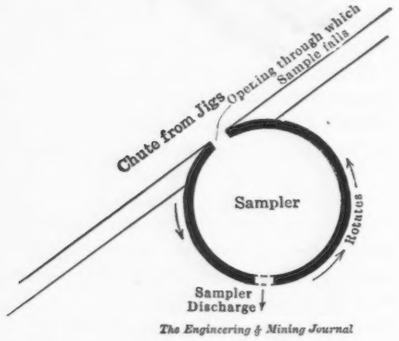
DETAILS of PRACTICAL MINING

Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

A Simple Sampling Device

The device used at the surface plant of the Crown Reserve mine, at Cobalt, Ont., for sampling jig tailings is easily constructed and gives satisfactory results.

A cylindrical steel sample cutter with a narrow slit (bounded by two elements of the surface) cut out of the shell is set below the bottom of an inclined chute for jig tailing in such a position that the cylinder extends across the bottom and slightly into the chute, the bottom of which is cut away at this point. The portion of the cylinder extending into the chute, at any one position, is cut out to form a slit into which the sample runs. A side view of this arrangement is shown in an accompanying drawing. The sampler is in the position in which the sample is cut.



SAMPLER USED IN A COBALT MILL

By varying the width of the slit in the sampler and rotating it at the proper speed, any desired proportion of the tailings passing through the chute can be cut.

At the Crown Reserve, with a slit about ½ in. wide in the cylinder and rotating the sampler once every 15 sec., a sample of about 500 lb. per day is obtained. The sampler empties itself through the same slit through which the material in the chute is diverted into it, and requires no special attention.

According to the annual report of the Montana-Tonopah Mining Company, covering operations for the fiscal year ended Aug. 31, 1910, the cyanide consumption in the mill was 2.126 lb. per ton of ore treated; that of lime, 7.68 lb.; zinc dust, 1.04 lb.; lead acetate, 0.345 lb., and acid, 0.38 lb. per ton. The ore averaged $15.22 per ton (0.206 oz. gold and 21.139 oz. silver).

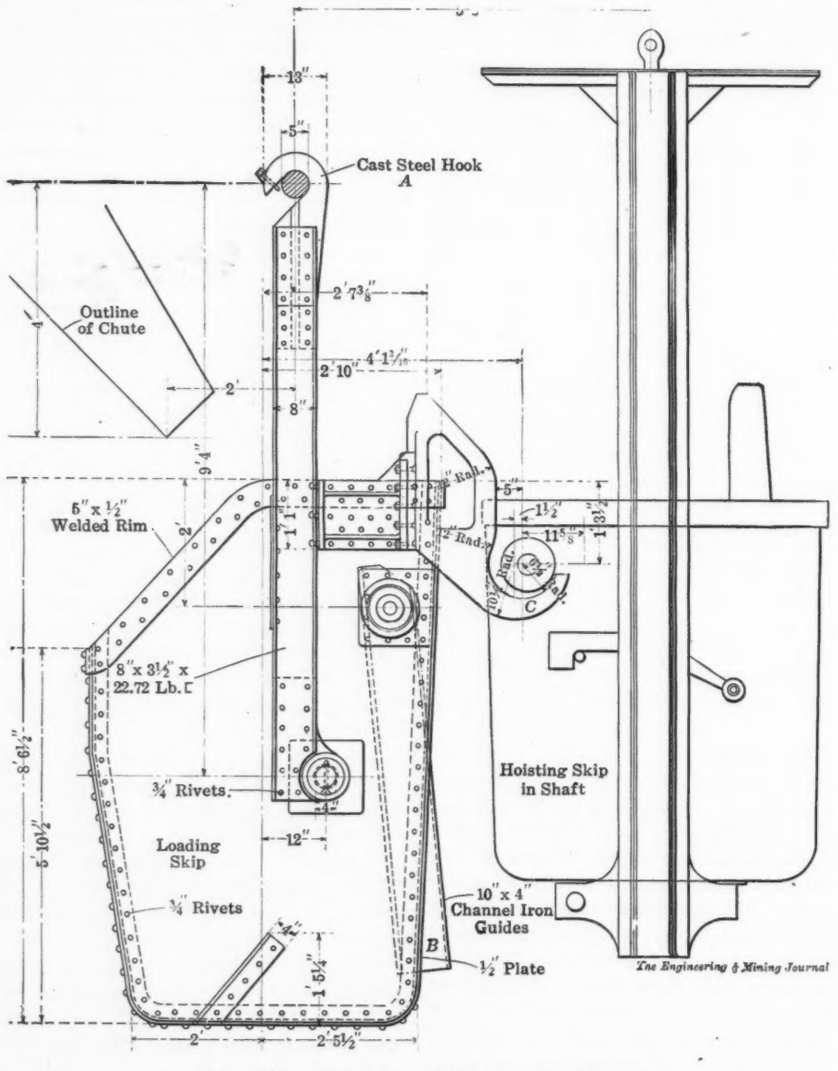
Whitford-Mills Skip Loading Device

BY E. M. WESTON*

The accompanying illustration shows an apparatus devised by Messrs. Whitford and Mills, general manager and engineer of the City Deep, Ltd., Johannesburg, S. A. It is designed to load five-ton skips faster than could be done by means of Kimberley chutes.

The idea consists essentially of a second skip in each compartment in front of the main doors of the bin at the bottom of the shaft. These skips hold five tons, as do the skips in the shaft, and are to be filled from the bin while the hoisting skips are running in the shafts. They are hung at *A* and balanced so that their movement while tipping is controlled by guides *B*, in such a manner that the hoisting skips on their descent tips them automatically by engaging the hooks *C* on either side. The loading skips themselves never project into the shaft even while tipping. In this manner hoisting could be carried on without any pause except for reversing the engines, say 15 seconds.

One possible drawback to the use of the device might be the possibility of damage to the apparatus by a skip reach-



THE WHITFORD-MILLS SKIP-LOADING DEVICE

*Mining engineer, 20 St. Mary's buildings, Johannesburg, S. A.

ing the loading station with too much velocity; but as electric winding is rapidly being adopted, this system can easily be adjusted for automatic action, and steam winding engines could also be provided with one of the well known types of automatic reversing and breaking devices.

Insulation of Electric Cables

The selection of insulating material for underground cables is a most important one, and the initial cost of this part of the installation should always be a secondary consideration. The best of materials, says R. G. Mackie (*Journ.* Transvaal Inst. Mech. Engrs., Oct., 1910), is necessary for insulating mine cables, and the conditions of a mine should be carefully studied before the insulating material is decided upon. Armored cables are not to be advocated in places where there would be a possibility of a serious squeeze, caused by a fall of rock, or a blow during blasting operations. Such a squeeze may cause the armor to puncture the conductor, producing a serious short circuit. The armoring and lead sheathing being earthed would become live conductors, and all work stopped until repairs were effected. Unarmored cables, apart from the portion installed in shafts with heavy braiding of rawhide, have been found durable in mines in some parts of the world. Cheapness means inferior insulation which will soon become defective.

Rapid deterioration may be caused by gases or other destructive agencies, and serious defects in the insulation of a cable will in time render it more dangerous than a bare wire, more especially if the sheathing is not effectively earthed. The large amount of moisture which is usually present in mines has a deteriorating effect on the insulation of cables. Acid water is harmful, and the presence of sulphur will ruin rubber insulation. When possible, cables should be taken into the mines by the downcast shaft. By doing this, the risk of damage to the insulation through its being exposed to a continuous stream of foul air in the upcast shaft, is avoided. Paper-insulated cable soaked in oil is now used to a large extent, but for vertical or incline shaft work, this is not to be recommended. The oil contained in the paper insulation of a cable has been known to burst the lead sheathing when hanging in a vertical shaft, due to the static pressure of the column of oil inside the sheathing.

Diamond Drill Reports

The accompanying illustration shows the types of diamond-drill report used in a number of the large Butte copper mines. The smaller form is used by the foreman on each machine who fills out such a report every day and turns it in to the head driller. From the reports of the foremen the head driller makes out his report, the form used being that of the larger one shown. The chief driller's reports are filed each day in the chief engineer's office.

DAILY REPORT DIAMOND DRILL

Location.....

Prospect No......191....

Depth from breast beginning of shift.....Feet
Depth from breast end of shift.....Feet
Distance Drilled.....Feet
Distance Reamed.....Feet
.....inch Casing put in.....Feet
.....inch Stand Pipe put in.....Feet

FROM	TO	FEET	MATERIAL

Remarks.....

.....Foreman

.....Mine

Report cause of delays, accidents, etc.

DAILY REPORT DIAMOND DRILL

Location.....*Level*.....*Mine*

Prospect No......191...

Depth from breast beginning of shift.....Feet
Depth from breast end of shift.....Feet
Distance Drilled.....Feet
Distance Reamed.....Feet
.....inch Casing put in.....Feet
.....inch Stand Pipe put in.....Feet

Carbons on Hand		Carbons in Bits		Carbons Received		Fragments on Hand	Loss in Drilling
Number	Carat	Number	Carat	Number	Carat	Carat	Carat

FROM	TO	FEET	MATERIAL	ASSAYS			
				Cu.	Ag.	Au.	Fe.

Remarks:.....

Report cause of delay, accidents, loss or breaking of carbons, etc.

Head Driller

The Engineering & Mining Journal.

BLANKS USED FOR DIAMOND-DRILL REPORTS AT BUTTE COPPER MINES

The chrysoprase mines of the Himalaya Mining Company, in the White River section of Tulare county, California, have yielded a large quantity of these gems in the last year. There are about four tons on hand of the rejected stones unfit for use in the better grades of jewelry, and these are shortly to be shipped to Hamburg, Germany, where they will be used in buttons, cheap jewelry and in mosaic work.

The Treatment of Overblown Charges in Copper Converters

BY A. R. MCKENZIE*

Many disastrous results, some of which have proved fatal, have occurred on account of the incorrect treatment of overblown charges in the copper converter. One of the first methods that was generally used to treat an overblown charge, which by the way was once a common occurrence, was to bank the slag and oxide of copper floating on the surface of the charge, with dirt from the floor. As this was found to chill the charge of copper materially, it was discontinued, and the throwing in of large pieces of cold matte was substituted. The matte would slowly melt and react with the oxides of copper, lowering the pitch of the copper so that it could be poured into molds. Although this method gave fairly good results, the copper would be cooled to a considerable extent and accumulate on the mouth of the converter while the charge was being poured.

The next attempt to improve the treatment of overblown charges, was to tap a small pot of matte from one of the re-smelting furnaces and add as much as was needed by means of hand ladles. The liquid matte would react almost immediately with the oxides, and after a few minutes the copper would be ready to pour. After the advent of the overhead electric crane, the problem was to a degree much simplified, but at the same time made more dangerous, from the standpoint of the inexperienced, as the following reaction and explanation will show. To calculate the liberation of sulphur dioxide (SO_2), when liquid matte is added to an overblown charge of copper,

*Great Falls, Mont.

let us for convenience assume that copper matte has the following composition — $Cu_2S \cdot FeS$, then:

$$5\,CuO + Cu_2S : FeS = 7\,Cu + FeO + 2\,SO_2$$
$$400 + 160 + 88 = 448 + 72 + 128$$

Thus we find that 248 oz. of matte ($Cu_2S \cdot FeS$) reacting with 400 oz. of CuO gives off 2 volumes of SO_2 gas or 44.44 cu.ft. at 0 deg. C. and 760-mm. pressure.

Correcting for temperature and pressure on the basis of atmospheric pressure at Great Falls, 677 mm. Hg., and assuming temperature in the converter as 1100 deg. C., we have,

$$44.44 \times \frac{760}{677} \times \frac{1100 + 273}{273} = 251 \text{ cu.ft.}$$

Thus the addition of 248 oz. of hot matte (15.5 lb.) to an overblown charge of copper will set free 251 cu.ft. of SO_2 gas at 1100 deg. C. and 677-mm. pressure or 16.2 cu.ft. per lb. of matte added. As ordinarily 1000 lb. of matte is used, this is sufficient to liberate 16,200 cu.ft. of gas.

Method of Adding Matte Safely

This is the reason why extreme caution is needed when adding liquid matte to an overblown charge of copper, for, should the above reaction take place almost instantly, the liberation of 16,200 cu.ft. of sulphur dioxide would rend the converter, and throw the contents of it in all directions. Consequently a safe *modus operandi* in the treatment of overblown charges should be as follows:

Should a skimmer be unfamiliar with the conditions, he should notify his foreman immediately, who should then inform the craneman that the charge has been overblown. (As a matter of safety it would be well to have a written notice posted in the crane describing the proper course to pursue.) Pour the liquid matte into the converter in very small doses, 10 to 15 lb. at a time, backing up the crane each time, until the SO_2 gas stops issuing copiously from the mouth of the converter. These doses should continue until no more SO_2 gas is evolved, after which a sufficient amount of matte should be added to compensate for the loss of heat due to the endothermic reaction between the oxides and sulphides. This generally amounts to as much additional matte as was used to reduce the copper oxides.

The converter should then be turned up and the charge refinished, and it will be found that the copper is in the proper condition to pour.

The thermal reactions which take place are as follows:

First reaction:

$$5\,CuO + Cu_2S + FeS = 7\,Cu + FeO + 2\,SO_2$$
$$5 \times 80 + 16 + 88 = 448 + 72 + 128$$
$$37.7 \times 5 + 20.. + 24 = .. + 65.7 + 138.5$$
$$-232.8 + 204. = -28.6 \text{ Cal.}$$

Thus it is seen that there is a loss of heat during the reaction; this together with the loss of heat due to radiation chills the charge in the converter. This loss of heat is compensated by the addition of the extra matte in excess of what is necessary to reduce the overblown copper.

Second reaction:

$$2(Cu_2S \cdot FeS) + 5O_2 + SiO_2 = 4\,Cu + 4\,SO_2 + \frac{(FeO)_2}{SiO_2}$$
$$320 + 176 + 160 + 60 = 256 + 256 + 204$$
$$2(20.3 + 24) + (..) + 180 = (..) + 4 \times 69.2 + 333.6$$
$$-268.6 + 610.4 = +341.8$$

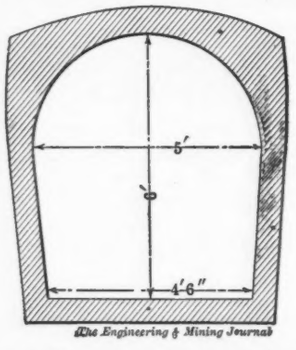
Or per molecular weight of $Cu_2S \cdot FeS = 170.9$ Cal.

In copper plants where the copper is taken from the converters and put into refining furnaces it is not necessary to be so particular about treating overblown charges as they will do no harm, as the charge must be rabbled anyway; but where the copper is taken from the converters in ladles and poured at a casting machine, as is the common practice in most plants, it is essential to have the copper hot and free from slag in order to prevent the excessive chilling of the copper in the ladles, and the subsequent breaking up of the skull and the resmelting of the same.

It is not at all improbable that some might work for years in plants without having seen a practical demonstration of treating overblown charges, and it is for such that I have written and given my demonstration of these phenomena.

A Concrete Pipe Conduit

At the Scranton mine, Hibbing, Minn., all the steam and air pipes are contained within a concrete conduit extending from the power house to the shaft, a distance of 260 ft. The electric cables will also be carried in the same conduit. The conduit is made of concrete and is 4 ft. 6 in. wide at the bottom and about 6 ft. high. The walls are 6 in. thick and arched at the top, as shown in the accompanying diagram. The advantages of a conduit of this character are that the pipes are accessible at all times; they are out of the way and protected from the weather, which is not the case with pipes carried on surface trestles; the temperature of the conduit is such that condensation in steam pipes will be far less than when the pipes are exposed to the weather, even though they are thoroughly boxed. Rings are anchored in the walls for supporting the pipes.



Concrete Conduit for Steam Pipes at Hibbing, Minn.

Types of Skip Dumps in New York Iron Mines

By Guy C. Stoltz*

The accompanying drawings illustrate several methods employed for dumping skips in the head-frame storage bins at the magnetite mines of northern New York. The car dump, shown in Fig. 1, has been used at the Forest of Dean mine in Orange county. Here the regular 2-ton mine cars, equipped with an end-locking door, are hoisted about 1800 ft. up a 23-deg. slope, to a point near the surface where the inclination is increased to 45 deg. At the storage bin the lever which actuates the locking device on the door is mechanically raised on encountering a flat iron truss *A* bolted to the rail stringer, the ore being discharged from the rear of the car. The car is then lowered to the hoisting level, the door locked, the cable disengaged and the car is trammed to the stope to be filled. The cable provided with a locking hook is then attached to a loaded car which is in waiting at the foot of the incline.

Skips in Inclined Shafts

The usual method of dumping adopted on incline hoists at Lyon mountain, Arnold hill and Mineville is shown in Fig. 2. At Mine 21, Mineville, the 2-ton skip cars are hoisted in balance on a 57-deg. slope, 800 ft. from the lowest level, and are dumped above the grizzlies by allowing the front wheels of 4-in. tread to leave the main stringers and take an almost horizontal course on a set of auxiliary stringers, while the rear wheels of 7-in. tread run over the dumping point on the inclination of the main stringers. No guides are used on the hoist and the front wheels of the skip are prevented from lifting off the rails in hoisting by having the bail press against lugs riveted on each side of the skip.

The wheels are stationary on the axle, the latter turning in brass-lined journals. This method of stationary wheels is to be recommended since the wheels cannot become loose or wabbly by wearing of wheel hubs or axles and consequently reduces to a minimum the chances of skips jumping the tracks. In case of an overwind through the dump the skip is hoisted in its dumping position of 45 deg., since lugs on the skip at the back bear against the bail as the skip assumes the angle of discharge.

The skip used at the Cheever mine, near Port Henry, N. Y., is shown in Fig. 3. The 4-ton skip cars are dumped by having the front wheels of 4-in. tread keep to the 30-deg. inclination of the main stringers, while the rear wheels

*Mining engineer, Mineville, N. Y.

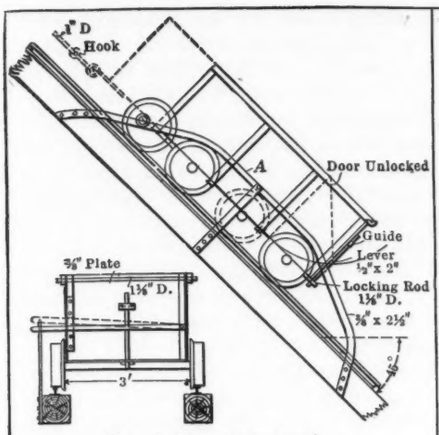


FIG. 1. Dump Car used at Forest of Dean Mine, N. Y.

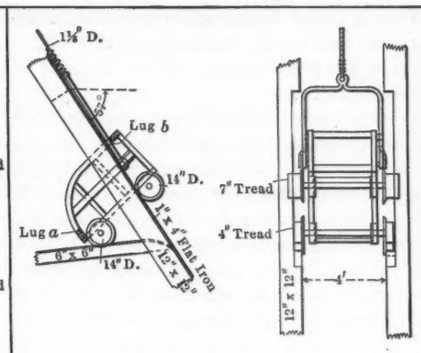
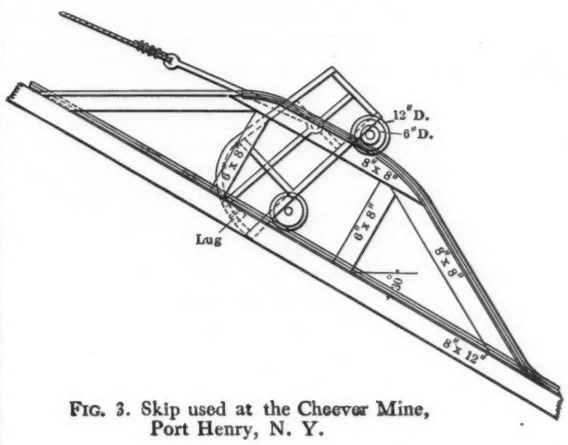


FIG. 2. Skip used at Lyon Mountain and Mineville, N. Y.



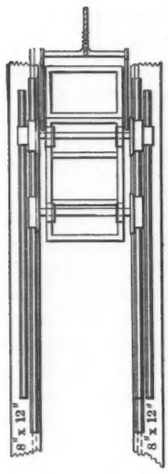


FIG. 3. Skip used at the Cheever Mine, Port Henry, N. Y.

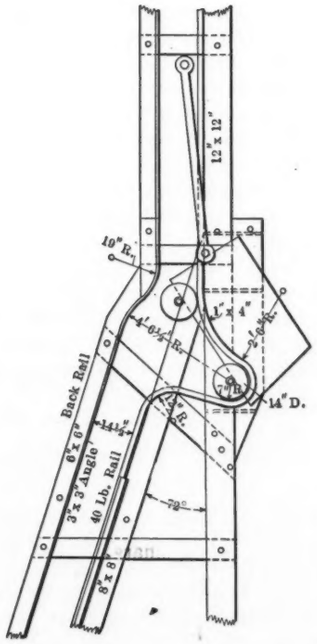


FIG. 4. Dumping Device used by Witherbee, Sherman & Co., Mineville, N. Y.

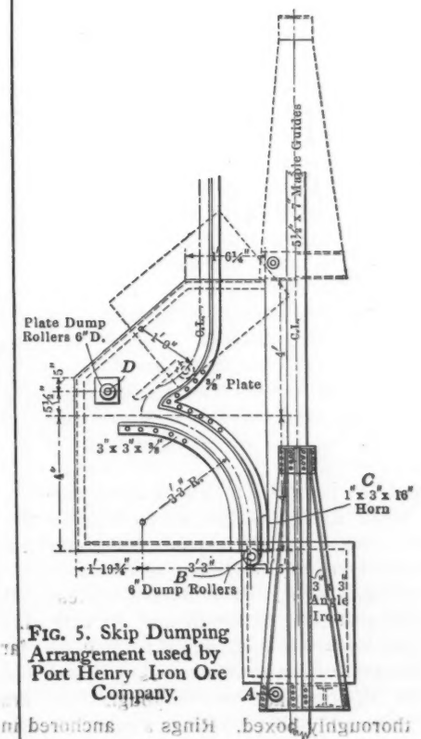


FIG. 5. Skip Dumping Arrangement used by Port Henry Iron Ore Company.

(which are cast with the usual 4-in. tread and diameter of the front wheel together with smaller wheels of like tread and smaller diameter) by means of the extended tread pass over a timber truss which causes the skip to assume the angle of discharge. In case of an overwind the upper members of the dumping truss provide for this and are inclined toward the inclination of the main stringers, so the skip on descending would readily stay to the stringers and lower over the truss and down the shaft. In the recently constructed headframes the same style of skip has been made to dump in the same manner as shown in Fig. 2.

SKIPS IN VERTICAL SHAFTS

The skip-dumping arrangement, in Fig. 4, used by Witherbee, Sherman & Co., at the Harmony A and B, Smith, Joker and Bonanza mines, in the Mineville district, is well designed and differs much from the usual types of dump. The fore and rear wheels have the same dimensions and are so guided at the dump that the tilting of the skip is positive, and in case of an overwind the back track guides will enable the skip to right itself quickly. At the Joker steel headframe 4-ton skips are dumped, while the same method is applied at all of the hoistways, vertical and inclined.

The dump used by the Port Henry Iron Ore Company in the steel headframe at the Clonan shaft is shown in Fig. 5. The 4-ton Kimberley skips are turned on the axle *A* by means of the rollers *B* taking a course away from the vertical guides as described by the angle-iron guides until the horns *C* intercept the rollers *D*, whereupon the skip rollers *B* are elevated to the upper angle-iron guides. The skip overwinds at approximately the angle of discharge.

Throughout the district, the hoisting cables are plow steel, 1 in. to 1⅛ in. in diameter, and are generally attached by passing through a clevis on the bail of the skip, being lapped 3 ft. and held by 3 to 6 grips. Iron head sheaves are 5 to 8 ft. in diameter. Eight to 14 ft. are allowed for overwinding. The usual gage of skipways is 4 feet.

After a large amount of experimental work in the blasting of rock, D. J. Hauer arrives at the following conclusions: (*Contractor*, Nov. 1, 1910) Two different explosives, for instance, black powder and dynamite, should not be used in the same hole. One will explode more rapidly than the other, and the second will be a total loss. As compared with black powder, it is a saving in money to use Judson and nitro-granular powders. Rock cuts should be breasted, especially if they be deep, otherwise much of the force of the explosive is lost.

The Copper Situation

The following views expressed by Hayden, Stone & Co., in a recent circular are of interest:

Periodically, and somewhat spasmodically, there appears in the press a great deal of talk about copper consolidations. This was most pronounced about a year ago this month, when some articles went so far as even to give the terms on which various shares of leading copper companies were to be exchanged for securities in the new consolidated company.

Recently this consolidation talk has been again active.

We wish to advise our clients that we do not believe that any consolidation of the four leading copper-producing interests is planned, contemplated or considered, nor do we believe that anything material would be gained by the consolidation of properties, widely scattered as to locality, in which there would be no great operating economies from a single management.

There must be, and will be, from time to time, a number of small consolidations of contiguous properties, or the absorption by parent companies, of the physical property of companies of which they own stock control. We do not think that such transactions will have any sudden effect on the properties affected, any more than did the absorption by Anaconda of the other properties in Butte, in which the Amalgamated people were interested.

But what is more important to the investor in copper stocks is a knowledge of whether he has made a good investment in a particular stock, and whether the situation of the copper metal market is such that an investment in copper stocks in general appears to be desirable.

In that connection we might say that, in our opinion, the copper metal situation, as viewed from the standpoint of the producer, is better today than it ever has been, and we see no reason why it should not continue to improve. From the standpoint of consumption we think that, taking the general business situation into consideration, the consumption has been quite satisfactory the past year.

. . . . . .

Now, having treated upon the question of the production and the consumption, there is but one other vital factor that is left for discussion, and that is—the selling.

Taking into consideration the ratio of consumption to production, the cost of production of the bulk of the world's product, and the question arising, "Are we getting for the product what it is entitled to receive," it is our opinion that we are not, and while we do not look for, or desire, high copper metal prices, and while we believe that stability in price is as much desired by the manufacturer as any abnormally low price, we do believe that a better price, under present conditions, could be obtained were there a more scientific selling of the product in this country.

It should not be forgotten that this country produces, approximately, three-quarters of the world's supply of copper, and that 50 per cent. of that product is exported; that the foreign purchases are bought in a most scientific way, and it is up to us in this country, who have the product to sell, to see that we meet that buying in an equally scientific manner.

In whatever industry Americans have undertaken, they have gradually adopted all improvements, and risen to the front, and we are equally sanguine that none of these many valuable copper properties will suffer from any such deficiency as above mentioned, but with the enormous growth of the copper industry there has been the past few years, it cannot be expected that these things can be accomplished in a minute, but all will come right in due time.

Utah Consolidated

Urban H. Broughton, president of the Utah Consolidated Mining Company, issued a statement, Dec. 1, regarding conditions of the property, as follows:

"In February last your directors thought it advisable to obtain an independent opinion upon the ore reserves of your property, and for that purpose J. W. Finch was engaged.

"He placed the ore developed and in reserve at 1,121,360 tons, against 1,237,470 tons estimated by Mr. Risque, who had been the company's manager for the previous four years. Since then up to Dec. 1, 1910, 130,000 tons have been extracted.

"Mr. Risque having resigned on Sept. 1 last, R. H. Channing Jr., under whose management in Utah your company attained its greatest prosperity, was appointed consulting engineer, and thereupon assumed charge of the mine.

"Mr. Channing reported on Sept. 24 last that from his examination there was not available for profitable extraction anything approximating the tonnage given in the last annual report.

"C. C. Burger, consulting engineer, was employed to make an examination of the property, and he, under date of Nov. 28, 1910, confirms Mr. Channing's report.

"Mr. Risque and Mr. Finch were notified regarding Mr. Channing's estimate, and a conference took place at Salt Lake City early in November, at which Messrs. Channing, Risque, Finch, Burger and the president of your company were present.

"Our understanding of Mr. Risque's explanation of his estimate is that he accepted when he assumed charge of the mine the estimated tonnage in each block of ground calculated on adjoining levels, adding thereto ore developed subsequently and deducting extraction. He did not recast these estimates from time to time, nor except in one orebody make proper deductions for mining losses, losses by caving or for ground in interior blocks found in exploitation to be waste or unprofitable. Mr. Finch's explanation is equally unsatisfactory, and both of their estimates are entirely irreconcilable with those of Messrs. Channing and Burger.

"From the reports and from additional investigation, we believe the following is accurate:

"Ore in sight, averaging 2.32 per cent. copper, 0.05 oz. gold, 0.85 oz. silver, 300,000 tons. From the large tonnage of ore shown by mine maps and records to exist, but which is inaccessible for inspection on account of caves and fills of waste, there may be recovered from 100,000 to 250,000 tons. Other ore in the mine is of too low grade for profitable extraction at the present price of copper.

"The output of profitable ore is limited at present to about 350 tons per day. That this is the proper limit is proved by the fact that to maintain a larger output from Jan. 1 to Sept. 1, 1910, a considerable percentage of unprofitable ore was shipped to the smelter.

"Development work is being pushed at all points, as directors believe this feature of more importance at present than the extraction of ore, and also because the output can be increased from time to time, as more working faces are exposed.

"To regain the position your company held during the years 1903 to 1907, it will be necessary to develop ore of a higher grade than that mined during the last two years. Both Mr. Channing and Mr. Burger believe that higher-grade ore will be found in the unexplored territory.

"At the present date developments upon the lowest level of your mine are promising, there being 320 ft. of drifts and raises in ore averaging 2.3 per cent. copper. In the opinion of your directors a strict classification of ore in sight has but little bearing upon the probable future tonnage.

"The aërial tramway, connecting the mine with the smelting plant of the International Smelting and Refining Company at Tooele, has not yet been taken over from the builders, but it is now working satisfactorily."

North Dakota Lignite

The U. S. Bureau of Mines has issued a bulletin on "North Dakota Lignite as a Fuel for Power Plant Boilers," describing a series of tests made at the pumping plant of the U. S. Reclamation Service, at Williston, N. D. Specially designed furnaces of the semi-gas-producer type are used. The peculiar features of their construction are the deep-set grate and shape of the space between the bridge wall and

the end of the firebrick arch. The fuel is gasified on the grate and the gases pass through the space under the arch into the combustion chamber, where they are burned.

The results of the tests on the lignite show that this fuel, though generally considered unsatisfactory, may be used with fair economy under boilers when fired to generate their full rated capacity. The tests are deemed important because the lignite deposits of the Northwest are so extensive, and the distance of the region from other coal fields is so great that a large portion of the United States, including parts of North Dakota, South Dakota and Montana, may be greatly benefited by any improvement in the methods of utilizing this local fuel supply. The lignite in this field has a low calorific power, some of it containing nearly 40 per cent. of moisture. It is difficult to burn in the furnaces commonly used for the better grades of coal, but the tests have shown the possibility of designing suitable furnaces for its profitable combustion. The bulletin, which may be obtained by addressing the director of the Bureau of Mines, will be of interest to fuel engineers, especially to those located in the lignite territory.

November Dividends

The accompanying table shows the amount per share and total amount of dividends paid during November, 1910, by a number of the leading mining and metallurgical companies in the United States, Canada and Mexico.

U. S. Mining Companies.	Situation.	Amt. per Share.	Total Amount Paid.
Alaska Mexican, g.	Alas.	0.30	$ 54,000
Alaska Treadwell, g.	Alas.	0.30	200,000
Alaska United, g.	Alas.	1.00	54,060
Amalgamated, c.	Mont.	0.50	769,439
Arizona Copper, pf.	Ariz.	0.047	53,839
Ariz. Copper, pf. "A"	Ariz.	....	5,768
Boston & Mont., c.	Mont.	4.00	600,000
BunkerHill&Sull.,s.l.	Ida	0.25	81,750
Camp Bird, g.	Colo.	0.24	267,850
Hecla, s. l.	Ida.	0.02	20,000
Homestake, g.	S. D.	0.50	109,200
International Nickel, pf.	N. Y.	1.50	133,689
Pacific Copper.	Mich.	1.00	40,000
Parrot S. & C.	Mont.	0.15	34,477
Stratton's Independence, g.	Colo.	0.50	500,000

U. S. Industrials.	Situation.	Amt. per Share.	Total Amount Paid.
Cambria Steel.	Penn.	0.62½	562,500
Lehigh Coal & Nav.	Penn.	1.00	482,936
Nat. Carbon, pf.	U. S.	1.75	78,750
U. S. Steel pf.	U. S.	1.75	6,304,919
Va.-Carolina Chem., com.	U. S.	1.25	349,905
Warwick I. & S.	U. S.	0.50	59,468

Foreign Mining Companies.	Situation.	Amt. per Share.	Total Amount Paid.
Almoloya, c.	Mex.	0.02	20,000
Amparo, s. g.	Mex.	0.03	60,000
Buffalo Mines Ltd., s.	Ont.	0.03	30,000
Comagas, s.	Ont.	0.15	120,000
Lucky-Tiger Com., g.	Mex.	0.05	35,750

Chronology of Mining for November, 1910

Nov. 3—Flood at Nome from heavy surf does great damage to property along the beach.

Nov. 6—Explosion at Lawson mine, of the Pacific Coal Company, at Black Diamond, Wash., kills 15 and does $250,000 damage.

Nov. 7—Fire destroys plant of Pennsylvania Coal Company, at Jamestown, Ark.; damage, $100,000.

Nov. 8—Explosion in Mine 3 of the Victor-American Fuel Company, Delagua, Colo., kills 45.

Nov. 12—Renewal of the European spelter convention, which with some modifications is extended from Jan. 1, 1911, to April 1, 1914.

Nov. 18—Newhouse tunnel, at Idaho Springs, Colo., completed; length, 21,968 ft.—Roosevelt tunnel, Cripple Creek, Colo., taps water from El Paso shaft.

Nov. 20—Serious political disturbances break out in Mexico preceded by anti-American demonstrations in Mexico City and Guadalajara.

Nov. 22—Louisiana Supreme Court decides that oil wells are not mines and hence not exempt from the State tax.

Nov. 26—Ten miners killed by explosion in Providence, Ky., coal mine.

Nov. 28—Compromise announced in the North Butte-Tuolumne apex and title suits, at Butte, Mont.—Explosion in the Jumbo asphalt mine, at Durant, Okla., kills 13.

Nov. 30—Montgomery-Shoshone mine, at Rhyolite, Nev., closed permanently after exhaustive exploration by drilling.—Close of navigation from Lake Superior iron and copper mines—President Broughton, of Utah Consolidated, announced that redetermination of ore reserves of Highland Boy mine showed them to be less that half of what was supposed.

Classification of Railroad Lands Asked for in California

The Los Angeles Chamber of Mines has entered official protest against the issuance of patents for the odd-numbered sections of land along the Santa Fe line from Mohave, Kern county, California, to Needles, San Bernardino county, which lands are being classified. There are several hundred mining claims scattered through the territory in question. The oil men want the mineral or nonmineral land officially determined, so that no mining ground shall pass to the railroad as agricultural, as has been the case in most parts of California. The Southern Pacific is asking for these patents on the ground that it was built by the Sante Fe line between the points named.

Secretary Ballinger's Report on Coal and Oil Lands

The annual report of Secretary of the Interior Richard A. Ballinger, has just been made public. From it we take the following excerpt in regard to the Alaska coal-land cases, and the leasing of coal and oil lands.

Alaska Coal Cases

"All the coal lands in Alaska not located prior to Nov. 12, 1906, are under the bond of withdrawals. Those located prior to said date are for the most part under departmental investigation on charges of fraud or irregularities, etc. These investigations have been taken up under a corps of trained officers with the view of securing the exact status of all such locations and entries. In the meantime no patents have issued and none will be issued except upon a full showing of compliance with law and departmental regulations. A class of entries, known as the Cunningham entries, made in 1907, has provoked wide discussion and popular interest, largely because of the alleged value and method of attempted acquisition.

"In view of such conditions I deem it of the highest importance that all these cases, involving 33 entries, or 5280 acres, of coal lands, be transferred from the jurisdiction of the General Land Office directly to the court of appeals of the District of Columbia for consideration and adjudication, without the necessity of a ruling as to the validity or invalidity of these entries by the commissioner of the General Land Office as is now required in such cases. This procedure may well be provided by special direction in the bill now pending in Congress for the authorization of appeals in land cases from the Interior Department to that court. I will have occasion to discuss further the importance of providing a method of appeal to the courts from decisions of the department in land cases.

"Reverting to the condition of the public land laws in Alaska, even the most cursory examination of them, in view of local conditions of climate, of isolation of territory, except as to ocean transportation, its vast extent and lack of homogeneity, satisfies all practical men that they are crude and unsuited to the best interests of the Government. On the other hand, experiments at amendment have placed the ban on development so that progress is at a deadlock. Without domestic coal in Alaska, railroad construction and operation is prohibitive, and without both only the roughest pioneer development is possible.

"In addition to the necessity of opening up and developing coal deposits in Alaska for railroad operation, it is equally important that it should be available for mining operations and as a means of sup-

plying the navy and trans-Pacific commerce.

LEASING COAL LANDS

"The secretary directs attention to the recommendations contained in his report for 1909 for coal-land legislation and quotes from an official statement made in 1907, wherein some of the difficulties which would be encountered in the operation of a leasing system are pointed out, and again calls attention to the importance of enacting legislation which would give the department an effective method of disposition of coal lands, especially in Alaska. He points out that in Alaska it is possible that a leasing system could be adapted to the country with efficiency and with less complication than in the States. In the States the administrative policy is to secure by appraisement and sale of the coal deposits what would accrue to the Government if the deposits were mined on a royalty basis, but this is not possible under existing law in Alaska, where the price is fixed at a flat acreage rate.

LEASING OIL LANDS

"The oil-land withdrawals now outstanding, including some private lands within the exterior limits, aggregate 4,500,000 acres, and are comprised within the States and Territories of Arizona, California, Colorado, Louisiana, New Mexico, Oregon, Idaho and Wyoming.

"I am in favor of a general leasing system of oil- and gas-bearing lands, such a system as will promote legitimate development of this industry, prevent monopoly, and conserve one of the great natural resources of the country. The oil land of the five civilized tribes in Oklahoma is developed on the leasing system, the term of the lease extending as long as oil is found in commercial quantities. The lessee usually pays to the Government for the use of the Indian one-eighth in value of the oil produced, as royalty. This system has worked out satisfactorily and is in use in many of the oil regions of the country where land is held in private ownership and not by the Government. I would apply the leasing system only to areas withdrawn for classification or classified by the Geological Survey. The unknown and unexplored oil lands I would leave open to exploration and location. This would give a reward to the diligent prospector. Even then the surrounding lands could be withdrawn from further location after the prospector had secured his first claims.

"I recommend that the Government adopt a liberal policy in opening the oil lands in California. The Government ought to support any movement which would reduce the enormous cost of fuel in California. The State ought to be asked to coöperate with the Government to prevent the monopoly of the oil business and effectually to secure a reasonable price to the consumer. In my judgment this can be accomplished if the State of California should declare the consumption of oil a public use. The State should pass a law to this effect, and place the regulation of the price of crude oil in the hands of a discreet commission."

Inspiration Copper Company

The report of Engineer Henry Krumb on the property of the Inspiration Copper Company, has just been made public. The property of this company is situated about eight to 10 miles west of Globe, in Gila county, Arizona, and covers 546 acres. The Arizona Eastern Railroad is now within about one mile of the company's property.

The ore is a disseminated deposit, the commercial orebody being about 180 ft. thick. We quote from the report as follows:

DEVELOPMENT AND EQUIPMENT

"Approximately 25,000 ft. of underground development work have been driven on the property. The main transportation tunnel has a length of 2075 ft., and is connected with the Joe Bush and Scorpion shafts. About 250 ft. remain to be driven to a connection with the Colorado shaft. The main development work has been done from the above three shafts, and the orebody has been opened for a length of 3200 ft., while with churn drills it has been developed for a length of 3800 feet.

"The churn-drill holes have been located regularly at the corners of squares with sides 200 ft. long. Up to Nov. 1, there have been completed 59 holes, with a total of 34,432 ft. of drilling. Roads aggregating 28,680 ft. in length have been built for the churn-drill operations. The accuracy of the churn-drill sampling has been checked by driving 625 ft. of raises alongside the drill holes, and by the general underground development. At different times, drifts and crosscuts aggregating 2390 ft. in length, have been resampled under my direction to check the sampling and assaying.

"The Joe Bush shaft is equipped with boilers and steam hoist, while the other shafts are temporarily equipped with gasolene hoists. Near the portal of the main tunnel there are 400-h.p. boilers, and a 15-drill compound steam compressor. A machine shop is in the course of erection. It will be completely equipped with lathe, drill press, shaper, bolt and pipe cutter, steam hammer, etc. An experimental mill of about 75 tons daily capacity is practically completed. It is fully equipped to make exhaustive concentration tests, on the results of which the design of a mill having a capacity of 5000 tons of ore per day will be based.

ORE RESERVES

"The ore reserves have been divided into two classes, namely; developed and partially developed. All developed ore is bounded either by drill holes or underground workings not in excess of 200 ft. apart. In areas not yet completely drilled, where the holes were up to 400 ft. apart, the ore has been classed as partially developed, but no ore has been allowed where the drill holes were more than 400 ft. apart, nor has any ore been allowed beyond the lines connecting the drill holes. In blocks where both drill holes and underground development existed, assays have been averaged in proportion to the lengths sampled.

"Up to Oct. 20, I estimate that there have been developed 12,396,000 tons of ore, averaging 2.03 per cent. copper, and 5,604,100 tons of ore partially developed, making the total developed and partially developed ore reserves 18,000,100 tons, averaging 2 per cent. copper. The total area developed and partially developed is 29.9 acres. This area is entirely on the eastern portion of the company's property, and considerable extensions of this orebody are practically assured. In the Woodson tunnel, on the western portion of the company's property, there are several hundred thousand tons of ore developed, but this ore has not been included in the above calculations of ore reserves. The indications are that a large orebody will be developed in this portion of the company's property. In an area east of the Joe Bush shaft, the capping is only from 50 to 100 ft. thick, and it may be possible to mine the ore in this area by open-cut methods. In other portions of the orebody, a caving system of mining will be adopted.

"It has been stated that there are 18,000,000 tons of ore developed and partially developed. It is practically assured that extensions of the eastern orebody will add a large tonnage to the known ore reserves. In the western part of the company's property, it is known from the developments in the Woodson tunnel and from the work on adjoining properties, that there is another orebody in this section, but no drilling has as yet been done in this part of the property, as it is the intention more thoroughly to develop the eastern orebody before moving the drills to the west."

Mr. Krumb estimates that when the property is in full operation on a basis of 5000 tons per day, the cost of copper delivered in New York will be between 9 and 9½c. per pound.

The Ingersoll-Rand Company has purchased the business of the A. S. Cameron Steam Pump Works.

Report of Montana-Tonopah Mining Company

At the eighth annual meeting of the Montana-Tonopah Mining Company, held at Salt Lake City, Utah, Sept. 13, 1910, directors were elected for the ensuing year. The board comprises: Henry D. Moore, Jacob R. Meyers, F. M. Kirk, W. E. Knowles, W. B. Alexander, Thomas J. Lynch, J. M. Wynn, Charles E. Morris and Charles E. Knox. At this meeting the reports of the president, superintendent, and secretary-treasurer were submitted.

The president in his report calls attention to the fact that, up to the present time, the long crosscut to the north, on the 765-ft. or bottom level had failed to disclose any new veins. He states, however, that at a point 2810 ft. north of the shaft the workings had encountered the early andesite, which is the mineral-bearing formation in the Tonopah district. At this point, the crosscut had been driven almost to the boundary line of the property, and as a result the directorate acquired the claims to the northeast, known as the Oddie-Egan group, comprising 55 acres, for which $9000 was paid. At the time the report was published, J. E. Spurr, geologist, was engaged in making a careful examination of the Montana-Tonopah and other properties in the camp. His deductions will be made public after he has completed his work on adjacent properties.

Superintendent's Report of Exhaustive Nature

The report of E. A. Collins gives much interesting data as to the production, cost, and milling work for operations of the fiscal year ended Aug. 31, 1910. The frankness of the statements is to be commended. The summary of the result of the year's operations is printed herewith. In addition to the total production of 50,245 tons of ore, 19,000 tons of waste were hoisted and trammed to the dump, although the greater part of the rock broken in development work was used to fill stopes. The average daily hoist duty was approximately 194 tons, equivalent to 261 cars. Of the total tonnage hoisted, 16,187 tons came from the first level, 14,243 from the second, 11,890 from the third, 20,976 from the fourth, and 5952 (5603 waste) from the bottom level.

Additional Development Work Increases Costs

The costs for breaking and handling ore during the year under review amounted to $3.414 per ton as against $3.47 per ton for the preceding year. The total cost per ton for development was $1.814 as against $1.645 for the preceding year. Detailed statement of expense taken over a period of eleven months, during which the average cost of mining was $3.397, development $1.836 and 45,922 tons were mined, is as follows: Ore breaking, $0.844; timbering, 0.221; hoisting and dumping, 0.254; blacksmithing, 0.038; surveying, 0.039; foremen and shift bosses, 0.075; sampling, 0.019; assaying, 0.027; sorting and shoveling, 0.618; tramming, 0.337; watchman, 0.014; storekeeper, 0.011; total labor, $2.487. The total cost per ton for supplies, $0.910, made up as follows: Ore breaking, 0.392; compressed air, 0.108; timbering, 0.201; hoisting and dumping, 0.084; hoisting (electrical power), 0.125. Development cost for the same period was $1.26 for labor and $0.576 for supplies, making a total for development of $1.836 per ton.

No New Developments of Importance

During the year a total of 10,681 ft. of new work was added. No new veins, or bonanzas, were discovered, but a large amount of productive work was done on the Triangle and Martha veins, which resulted in the development of milling ore. Both veins have been developed extensively down to the fourth or 615-ft. level. A drift now being driven on the 765-ft. level to get under a winze from the fourth level will provide good air and demonstrate whether the vein on which the winze was sunk reaches the bottom level.

SUMMARY OF OPERATIONS IN YEAR ENDED AUG. 31, 1910.

Tons milled	50,245
Tons mined	50,245
Gross value per ton	$15.22
Receipts per ton	$12.94
Costs per ton	$10.26
Profit per ton	$2.68
Development work (ft.)	10,681

The average cost per foot of development work and general charges was as follows: Drifting, $6.24 per foot; crosscutting, $5.83; raising, $5.10; sinking, $14.43. Of the total development work, approximately 42 per cent. is classed as ore development. One foot of drifting or crosscutting was done for every five tons of ore mined during the year.

Superintendent Collins states that, owing to the faulted condition of the orebodies and the difficulty in outlining their limits without a large amount of otherwise unnecessary expense, it is difficult to make any accurate estimate of ore reserves. His figure for probable ore available in the mine on Aug. 31, 1910, is 26,000 tons. This figure is a little less than that for the corresponding estimate of the previous year.

Mill Extraction Increased

During the year an average of 38½ out of 40 stamps dropped continuously. Stamp duty was 3.67 tons per 24 hours, as compared with 3.7 tons during the previous year. The average value of the 50,245 tons of ore milled was $15.22 per ton (0.206 oz. gold and 21.139 oz. silver). The average value of the mill tailings was $1.43 (0.0146 oz. gold and 2.168 oz. silver). The gross mill extraction was, therefore, 90.8 per cent. During the first three months of the year, extensive repairs were necessary, but after February the milling costs showed a marked reduction, the average for six months from February to July, inclusive, being $3.37, a decrease of 36c. per ton. Credit for this increased efficiency and consequent reduction of the cost of milling is given to B. A. Bosqui, who has been in charge of this department since January last.

Shipments of concentrate and bullion during the year were as follows: 1076 tons of concentrate having a gross value per ton of $253.52 (estimated net value, $245,304); 39,981 lb. of bullion, average fineness, gold, 11.6, silver, 890.6 (estimated net value, $405,100). The bullion cost was 53.4c. per ounce produced and the price realized was 67.4c. per ounce.

Analysis of the cost of milling operations shows that the only item showing a substantial reduction is that for power. By avoiding excessive peaks, a reduction of 11c. per ton was effected. Segregated costs for milling were: Labor, $1.123; supplies, 1.016; general, including heating, water, etc., 1.353; power, 0.306; total, $3.798.

The superintendent states that net receipts for the year were $650,405; total expenditures, excluding any charge for depreciation, $515,689 ($10.263 per ton of ore mined and milled). The estimated profit on the year's work was, therefore, $134,715.

New Construction and Improvements

During the year several improvements were made at the company's property. A second Diester table was installed in the vanner-room addition, and two of these tables handle the entire overflow from the thickening cones. An auxiliary pumping plant, comprising a 4x6-in. direct-connected triplex pump, was installed to supply the mill storage tanks from the Mizpah pipe line. Five tanks with a combined capacity of 60,000 gal. were set up to supply the mill, boilers, etc. The office building was remodeled and enlarged.

The report of the secretary-treasurer, W. B. Alexander, lists the receipts and disbursements for the fiscal year ended Aug. 31, 1910. The total standing on each side of this account is $786,821. The balance on hand, Aug. 31, 1909, was $49,493; supplies, $37,410; bills collect-

able, $305. At the end of the year, Aug. 31, 1910, cash on hand was $177,702; supplies on hand, $32,931; voucher accounts payable, $136,208; bills collectable, $269. From such a statement, practically a cash account, it is impossible to determine the profit from the year's operations. No sum is set aside to provide for depreciation of the plant.

Copper Castings of High Conductivity

A new process for making copper castings of high conductivity has lately been worked out at the Lynn laboratory of the General Electric Company. According to Dr. E. Weintraub[1] the difficulty in making a high-conductivity copper primarily consisted in the affinity of molten copper for oxygen. Various methods were tried for getting rid of this impurity, but all had the common disadvantage that the deoxidizer would itself combine with the copper, and in that way leave the conductivity no better than before.

Dr. Weintraub discovered a method of preparing boron and reports that in his work he was struck with the lack of affinity displayed by this element at ordinary temperatures, which resulted in trying it as a deoxidizer on copper.

At the melting point of copper, boron and its compounds have practically no affinity for it, while combining readily with both oxygen and nitrogen. However, the cost was rather against it. But one product obtained in the boron investigation contained only oxygen in small amounts as an impurity, and this substance, called "boron suboxide" by its discoverer, was used in later experiments.

By use of this compound high-conductivity castings which can be easily machined are readily made. As excess of the reagent does not harm the copper it is an entirely safe method for the foundry. The cost is given at about 0.73c. per lb. of copper, and a conductivity of 90 is guaranteed for the method.

Dr. Weintraub announces that he is working on the effect of the reagent on various copper alloys, and also the possibilities of a boronizing operation replacing the present one of poling copper. However, it is a long step from the 0.73c. per lb. of the present boronizing process to a commercial poling cost, when one figures that the entire cost of casting cathodes to wirebars, including poling, is only about 0.075 per lb. of copper.

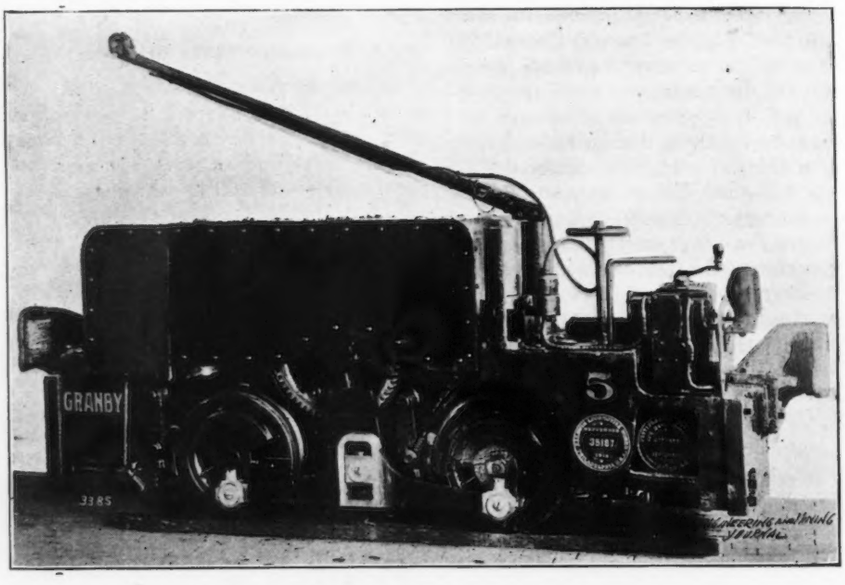
The use of the process at present lies in its adaptation to electrical work where riveted, soldered, or screwed joints can be eliminated by making large, high-conductivity castings, and by replacing the alloys of copper, formerly used because they made good castings while the copper did not.

[1]Address before the American Electrochemical Society, Oct. 13, 1910.

A New Baldwin Electric Locomotive

The Baldwin Locomotive Works has recently built for the Granby Consolidated Mining, Smelting and Power Company, of British Columbia, an electric locomotive of the mining type, shown in the accompanying illustration. The electrical equipment for this machine was furnished by the Westinghouse Electric and Manufacturing Company. Owing to the narrow gage and restricted width limit, the design required special treatment; and the result is a compact locomotive, simple in construction and with running parts easily accessible.

The frames are of cast iron, placed inside the wheels, and the bumpers are of the same material. Coil springs support the frames on the journal boxes. The propelling equipment consists of two



BALDWIN 20-IN. GAGE ELECTRIC LOCOMOTIVE

No. K-6 motors wound for 500 volts. These are rigidly mounted on top of the frames, and are both geared to a transverse shaft which is, in turn, geared to a jack shaft. The latter has cranks secured to its outer ends and these drive the wheels through combined side rods and Scotch yokes. The driving wheels are steel tired with cast-iron centers, and are counterbalanced as in steam-locomotive practice. The motors and resistance coils are placed under a sheet-iron cover having removable lids, so that all parts are easily accessible.

With this arrangement, motors of large capacity can be provided without exceeding the width limit, while a maximum proportion of the weight is spring supported. The equipment of this locomotive includes electric headlights, two-pocket draw castings, hand brake, gong and sand boxes with spouts to all the wheels. Two trolley-pole sockets are provided, and are placed right and left near the front end of the locomotive.

The principal dimensions are as follows: Gage, 1 ft. 8 in.; wheel base, 3 ft. 6 in.; drivers, 20 in. diameter; journals, 3¼x4½ in.; width, 2 ft. 10 in.; hight, 3 ft. 9½ in.; length, 9 ft. 0 in.; weight, 12,000 pounds.

Postal Banks for Mining Camps

The board of trustees of the postal savings-bank system has approved a list of 48 second-class postoffices where the plan will be given its first trial. Many of the places selected, particularly those in the West, are mining camps not adequately provided with savings institutions and a large patronage of the service is expected both from native and from foreign-born miners, who are now remitting their savings to their native countries. Among the mining centers designated for banks are: Globe, Ariz.; Leadville, Colo.; Oroville, Cal.; Anaconda, Mont.; Carson, Nev.; Raton, N. M.; Deadwood, South Dakota.

New Map of a California Oilfield

A complete map of the Whittier-Olinda oilfield in Los Angeles and Orange counties, California, has recently been published by the California State Mining Bureau. The producing, drilling and abandoned wells, wagon roads, railroads, pipe lines, the specific gravity of the oils produced and other details necessary to convey the fullest and most accurate information regarding the field are shown.

A bulletin containing much information that has not been published regarding the Whittier-Olinda and other California fields is in course of preparation.

The Antigua Mines of Real de Sivirijoa, Sinaloa

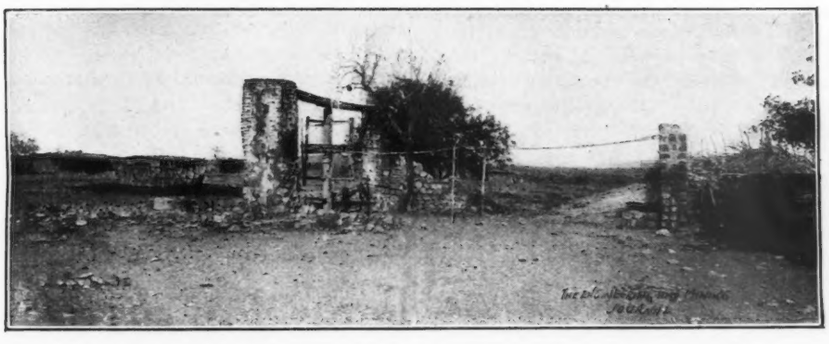
Discovered in 1715, Furnished Silver to Spanish Crown for Nearly a Century. Closed on Account of Water. Efforts to Reopen Failed

BY E. A. H. TAYS*

In 1715, a pack train left the port of Agiabampo loaded with merchandise for Fuerte, and the second night out stopped on the road at the top of a little ridge; camp fires were built at the side of a ridge of exposed rock. The next morning, so the story is told, one of the packers, in scraping around the fire, noticed shiny spots on the rock, which, upon closer examination, proved to be little globules of silver. This was the beginning of the famous old Sivirijoa mines, that yielded silver to the Spanish crown for about 90 years; the same story goes with nearly all the Mexican *antiguas*.

Mines in Accessible Situation

The Real de Sivirijoa is situated on the ranch of Las Lomas in the State of Sinaloa, Mexico, about 30 miles east of the port of Agiabampo and but three miles west of the Fuerte river, and four miles west from Vega, a station on the main line of the Kansas City, Mexico & Orient Railroad. Its geographical situation is, latitude 26 deg. 15 min. north, and longitude 103 deg. 45 min. west. The surrounding country is rolling and dotted here and there with small eruptive buttes. The elevation at the mines is about 225 ft. above sea level.



Malacate at San Antonio Mine, Sivirijoa. The Southern Pacific Tracks Now Run Across Foreground

Camp Long Ago Deserted

Within a few years after the discovery a town of 2000 inhabitants had grown up and the mines were being exploited on rather a large scale. Gamboa makes mention of them in 1761, at a time when they were at their best. At present nothing remains but the ruins of the church, a prominent feature of every old Spanish mining camp, the old dumps and a few shacks occupied by the ranch *vaqueros;* a dreary, sorry-looking place.

On the claims there are many signs of old arrastres. No tailings dumps are visible. But three miles away, on the edge of an almost obliterated lagoon, near the river, are found piles of tailings that were washed and concentrated by the natives, as recently as 10 years ago. The surrounding country is overgrown with brush and trees, and one of the old shafts is used as a well, from which the owner of the ranch waters his cattle.

Vein Persistent—Ore Sulphides of Silver in Quartz

The vein crops strongly along the surface for about 2000 ft., with shoots of ore at each end. The general course of the ledge is from north 12 deg. west to north 20 deg. east, with a dip of about 55 deg. to east in the south shoot or Caiman workings, and of but 20 deg. to east in the north shoot on the San Antonio workings.

The width of the vein is from 4 to 7 ft.; but, on the surface, the Caiman shoot is fully 30 ft. wide, and most of this has been worked out. A pillar at bottom of the open pit, assays 45 oz. silver per ton. In the brush, near the old workings, both north and south, are large dumps that carry an average of 8 oz. silver per ton.

The gangue is quartz and altered country rock, with here and there bunches of baryte. The contained metals are mostly in a sulphide form. The country rock is a metamorphosed andesite tufa-agglomerate, and the whole surrounding country for several miles is highly mineralized, with numerous veins.

Closed on Account of Flooded Workings

The history of these mines from 1715 to 1800 is a mere tradition. On good authority, it is said that they paid the Spanish crown, during the eighteenth century, in *quintas* (a 20 per cent. tax), 25,000,000 pesos in silver. About 1800 a large flow of water was encountered in the Caiman workings, too much for the means of unwatering employed at that time, so work had to be suspended and since then the mines have remained unexploited.

Efforts Made to Unwater Mines

Several ineffectual efforts have, however, been made to unwater them, but all have failed. Soon after they were abandoned, a rancher from near the coast tried to unwater the Caiman workings, but, after he had killed many mules in the effort, gave it up. Nothing further was done until about 1864. At that time an adventurous Englishman, Capt. George Walker, secured some old documentary evidence as to the richness of the mines; one report, it is said, stated that the bonanza ore in both workings assayed as high as 30 per cent. in silver, and that the main workings of the San Antonio mine were under the old church. With the evidence he secured as a basis, Captain Walker succeeded in forming a company in San Francisco, Cal., called the Sivirijoa Mining Company, and to have himself made superintendent.

Captain Walker spent considerable money on a fine residence at the mines, ruins of which still remain, and on champagne dinners in Fuerte, and some on an old shaft sunk by the natives. He pumped this out and ran a short crosscut from it toward the vein, but, due, it is said, to the heavy flow of water, he stopped work at this old shaft, shown in the accompanying view, and put a cornish pump into the Caiman shaft.

San Francisco Company Passes Out of Existence

About this time a new superintendent, James Broom-Smith, was sent out, and he did some general work in the Caiman, and finally, in 1867, ran a crosscut and cut a ledge 5 ft. wide carrying ore assaying from 25 to 125 oz. silver per ton.

The company was in financial straits by that time, so Mr. Broom-Smith took several sacks of the newly found ore and started for San Francisco to satisfy the directors that there really was good ore in the old mine. At Agiabampo he boarded the schooner "Telemaco" for Guaymas, but in a storm one night was washed overboard and perished. This wound up

*Mining engineer, San Blas, Sinaloa, Mex.

the Sivirijoa Mining Company. The water in the Caiman was never lowered over 20 ft., even in Mr. Broom-Smith's time.

Properties Change Hands Several Times

About 1881 the claims were denounced by Don Adolfo Ibarra, of Fuerte, who knew the history of the mines, and took them up as a speculation. In 1883 he sold them to Becerra Hermanos. These gentlemen were miners, and one brother a mining engineer. They secured a special concession from the Mexican Government with the intention of thoroughly exploring the properties and, once for all, proving their value. In 1889 the engineer died suddenly in London, and in 1893 the firm dropped the concession and the properties were taken up by the present owner of the Caiman.

Indications Are of Rich Orebodies

Much of the data about the Sivirijoa mines is based on tradition, but some is authentic, and the extensive workings and dumps prove that here existed an important mining camp. There is every indication that large and rich orebodies were worked; and fairly authentic accounts lead one to believe that, in the Caiman, anyway, several stopes were left in rich ore. The little documentary evidence known indicates that the stopes in San Antonio, under the old church, gave bonanza ore.

The present water level in the Caiman is about 60 ft. from the surface, and at this level there is a drift about 200 ft. long by 15 ft. wide, above which the orebody is stoped out to the surface from wall to wall.

A Guano Mine—Old Workings Home for Innumerable Bats

The surface of the water is covered with bat droppings, and this has settled in the water to such a depth that a man can walk over it with impunity. Much guano is taken from these workings every year, and often the sacks of guano are piled upon the crust formed over the water.

That the old workings must be very extensive above water level is indicated by the millions of bats that make the mine their home. Every evening during the rainy season a continuous stream of bats, six feet in diameter, rises out of the entrance of the open cut, like a column of smoke from a crater. This column of flesh rises steadily for three hours to a hight of over 500 ft., and every little while a great cloud of bats will break from it and fly off in a different direction. These clouds are so large that they can be seen with the naked eye for 20 miles or more, and so thick that they often shade the sun when flying between it and the observer. At the crater-like entrance, as the bats rise from the bowels of the mine, they swarm on the sides until they "get their eyes," crawling over each other until the walls are a moving, mephitic mass; a sight to make the hardiest shudder. As they become accustomed to the light, they fly into the slowly rising column. Around the mouth of the mine numerous hawks sit on the nearby branches and from time to time drift lazily across the column to pick off a bat for their next meal.

Every morning, from daylight to as late as 10 o'clock, the horde of bats returns and the roar of the descending column can be heard for several hundred yards. The incoming clouds of bats converge to a point about 1000 ft. above the entrance of the mine, and then each bat closes its wings and drops, catching itself up two or three times in the descent, by opening its wings. The velocity of this fall is great and the hawks now have to greatly exert themselves to capture a bat as it drops for the entrance, and misses are quite frequent. Where they store themselves is a mystery that no man will solve until the old workings are opened, for it would be death to anyone caught in the entrance of the mine at the time of the exit or return. The stench alone would kill a man, especially during the egression.

Water Probably Could be Easily Handled

The flow of water encountered in 1800 is said to have been large, and the local opinion is that the workings connect with the river three miles away; but this is hardly likely, as the ledge runs more or less parallel with the river and dips more than a mile under it. As the mine water is very brackish, due to the various salts from the decomposition of the feldspar of the country rock, its source is probably local, and from the surface. The flow may have been large 100 years ago, but, for years, the annual rainfall has been decreasing, so that now the water for 500 ft. in depth could likely be handled with a 4-in. pump.

The name Caiman is said to have originated from a large piece of native silver encountered in the mine, having the shape of an alligator, *caiman* being the Spanish for alligator. The old name of the Caiman was La Crucesita.

Value of Mines Problematical

Not much more is known about these interesting old mines lying on the coastal plain of Mexico, and almost at sea level. Little faith can be placed in the local traditions, for the richness of the old stopes and the certainty of their existence increases with each succeeding generation. Neither is it always safe to take up *antiguas* on their traditions, for the old Spaniard was a keen miner and followed his ore. However, he was ignorant of common mining phenomena, and the lowering of the value of the ore often stopped him; when a fault cut off his ore, he rarely sought the continuation of it in barren ground. As these two causes have been the most usual for the abandonment of the old mines in Mexico, many of the *antiguas* have responded to modern development and exploration. The Sivirijoa mines are well located for exploitation. The Southern Pacific of of Mexico railroad runs across the claims. It is probable that some day they will again be worked.

A Bit of Mining History

In a book written in 1838, and published in that year at Hartford, Conn., by J. M. Miles, a member of the U. S. Senate, is an interesting reference to the mining development of Mexico and to the Valenciania mine of Guanajuato. It says:

"The increase and extension of mining operations (in Mexico) were astonishingly great from 1790 to the commencement of the late revolution. The cause of this increase Humboldt attributes 'to the increase of population on the table land, the progress of knowledge and national industry, the freedom of trade conceded to America in 1778, the facility of procuring at a cheap rate the iron and steel necessary for the mines, the fall in the price of mercury, the discovery of the mines of Valenciana and Catorce and the establishment of the Tribunal of Mineria.' In the mine of Valenciana there were before the revolution 1800 workmen; an administrator with a salary of $12,000 . . . The expenses of powder alone for this mine has amounted to $80,000 and the steel for the implements to $27,000. When Humboldt visited this mine in 1803 a new draught-pit was opening which was to be sunk to the astonishing depth of 1685 ft. into the bowels of the earth; it was 87 ft. in circumference and estimated to cost one million of dollars."

Zacatecas and Orient Railway Concession

The formal construction concession for the building of the Zacatecas & Orient railway was signed by Governor Zarate, of the State of Zacatecas, in April, 1910. This concession is said to be a renewal of a former concession under modified conditions. By the terms of the concession the construction of the road was to have been begun by June 1, 1910. This road will have a length of 170 km. on the main line from Camacho station on the Mexican Central line, extending east to Mazapil, and a branch is projected to extend from Cedros northeast to the mining camp of Bonanza. This road provides an outlet to the west for the important mining districts of Mazapil and Bonanza and also traverses a district rich in guayule.

Protecting Investors by Exposing Mining Frauds

Publicity of Details and Legislation to Prevent Fraudulent Operations Needed to Supplement Work of Postal Authorities; The Lost Bullion Case

BY C. S. THOMAS, JR.*

A great deal is being said and many useless and impotent resolutions are being adopted by several mining associations for the protection of investors. These resolutions have for their main theme, not the attempt to prevent the activity of the "wildcatter" so much as to arouse public opinion to a point where he will be obliged to render periodical reports at short intervals. No attempt is made to make him show authority for his statements nor to end the practice of so-called mining engineers who would not know a mine from a sawmill. The general enforcement of such resolutions as have been published in the mining magazines would only be a picayune annoyance to the wildcatter in that it would only require him to manufacture a lot of testimony for publication.

Legislation and Publicity Needed

The example is needed most of all of a few convictions and penitentiary sentences for such "cattle" and great publicity regarding the trials in court. But before that, legislation is necessary which shall make false mine reports and the use of the title "mining engineer," where not applicable, criminal and punishable, not by fine, but by both fine and imprisonment. There is little difference between actual embezzlement and the obtaining of money for mines that are known to be of no value, and even than putting only a small part of the money into the so-called mine.

One difficulty is that the courts are more prone to hair-splitting of technicalities than they are to common-sense administration of justice which makes definite and all-embracing legislation necessary.

The first step in obtaining this action seems to be the publication of such facts as may be obtained bearing on methods of wildcatters and a description of such wildcat mines as may be seen at close range. This constitutes an education against illegitimate mining. The postal authorities are doing what they can to stop the carrying of fraudulent literature, but they are handicapped to some extent by the courts. One judge stated in throwing a postal case out of court that he was "tired of being wet nurse to a lot of suckers who have passed their majority and don't know what to do with their money."

*Mining engineer, Symes building, Denver, Colo.

In the course of my experience I assisted in the examination of the property of the Lost Bullion Spanish Mines Company. This examination was made after the harm had been done and after the case had been tried in court and the promoters of the enterprise found guilty of fraud. It was therefore merely an exhumation of the remains and the preparation of an obituary for the enlightenment of certain Eastern investors, who, even after the volume of testimony conclusively proving fraud had been given in court, were still possessed of a fond delusion that they might have something of value.

Case of the Lost Bullion Spanish Mines

Certain unscrupulous gentlemen of Denver, and Boulder, Colo., got together and embarked on the uncertain tide of misrepresentation, clothed in the disguise of high finance, and were responsible both for the production of a great imaginative creation and the despoiling of a number of investors whose money seemed to be very insecurely held. The prospectus of the company states that these gentlemen are honest, highly respected and of great experience and renown in mining matters. Who can doubt such a statement when banks are in the habit of giving good character to anyone who may have an account with them? The bank which gives such a recommendation will in nine cases out of ten refuse to loan money to such men unless doubly secured. But the investor at a distance does not know this, and he places his trust, together with his savings, in the hands of such men.

In mining, the romance of the poor prospector who makes a "find" after years of toil and poverty, and wakes up to find himself a millionaire, is potent. The bigger story of the poor prospector who looks throughout his life and never finds anything, or the story of the failures whose monuments in the shape of dumps, gallows frames and dismantled mills decorate the entire country, is never heard. What is more romantic and exciting than the imaginative side lights on the conquest of Mexico dealing with fabulously rich mines? Therefore, the name "Spanish" for this mine was a most excellent one and the addition of "bullion," to convey the idea of stacks of ingots of pure gold, could not have been better. The company was organized under the name of the Lost Bullion Spanish Mines Company, under charter from the Territory of Arizona, and was capitalized for $10,000,000 worth of $1 shares.

Acquisition of Property

In order to acquire property without incurring the penalties of embezzlement or improper use of funds, two dummy companies were created, the Security Investment and Mines Company, and the Financial Security and Mines Company. The boards of directors of these two companies and of the Lost Bullion Spanish Mines Company were practically the same. At the direction of the manager of the Lost Bullion company, who was also the president of the Security Investment company, a man on the payroll of the Lost Bullion company located nine claims near Silver City, N. M., in the name of the Security Investment company, and nine in the name of the Financial Security company. These claims and $35,000 cash were given for the total capital stock of the Lost Bullion Spanish Mines Company, less five shares given to directors. This deal consummated, the moving spirit of the enterprise donated six million shares to the Lost Bullion company, to be sold as treasury stock. These claims were referred to as the Rio group. The Spanish group of 14 claims and the Mañana group of 9 claims, all adjoining the Rio group, were then located for the Financial Security and Mines Company by the Lost Bullion company's agent. This was evidently for the purpose of getting back the $35,000 paid to the Lost Bullion company for its entire capital stock, because the terms of settlement for the two latter groups of claims were for a total consideration of $150,000—$35,000 cash payment.

Results of These Manipulations

The outcome of all this manœuvering was that the Security Mines and Investment Company and the Financial Security and Mines Company, by means of an agent employed by the Lost Bullion company, located all the claims at no cost to themselves and turned them over to the Lost Bullion company for $150,000 and 3,999,995 shares of stock, less $35,000—which went in and out again.

One feature of the situation was that, owing to the practice of wildcatters, which seems to be that as little money as possible should go into development, the location work on the property was not done, nor were the claims properly monumented. The claims, therefore, never

really belonged to anybody, but continued to be a part of the public domain.

Reckoning the value of the stock at 5c. per share, the lowest price at which it ever sold, the total cost to the Lost Bullion company for these three groups of claims was $314,999.75. And not a pound of ore in sight on a single claim!

A financial statement published by the Lost Bullion company during the early stages of promotion shows the commissions paid amounted to more than 10 per cent. of the entire amount involved, and about 25 per cent. of stock-sale receipts; the miscellaneous account was nearly 10 per cent. of the whole, and probably was spent on advertising. Mining expense was the smallest item, with the exception of clerical expense.

Early Advertisement

The gullibility of the average newspaper reporter when confronted with news of things of which he knows nothing is well known, and no difficulty was had in securing a few press notices. These notices in facsimile were inclosed, together with a prospectus pamphlet and a copy of assay certificates, in envelopes containing circular letters, and distributed broad cast. The circular letter stated in part: "We inclose herewith maps and engineers' reports relative to the famous lost Spanish mine, which was recently uncovered near Silver City, N. M.

"You no doubt are acquainted through the newspaper articles of the recent excitement caused in this district by the reported discovery of a famous lost Spanish mine, with its miles of workings through fabulously rich mineral ground, and in which workings it is supposed, there is hidden millions of dollars worth of rich bullion left by the Spaniards in their hasty flight from the wrath of the native Indians."

It is then stated that the services of three eminent mining engineers were obtained to make as exhaustive an examination as possible, that each examination was to be independent and that no engineer had knowledge of the fact that others were employed, it being desired that the final reports should be absolutely unbiased by collaboration and that all reports being favorable, the company secured the property at great cost and with great difficulty and had decided to sell a little treasury stock for development. The addressee is informed, as usual, that "you are getting in on the ground floor with the original promoters of the company." The literature accompanying this letter was both lurid and voluminous.

The Prospectus a Work of Art

The prospectus was a literary gem of the type politely called fiction, but described by the untactful in stronger language. The self-confidence of the writer increased as he proceeded and his enthusiasm, if applied to generate power, would forever banish the bugbear of future available coal supply. The depth of his feeling and anxiety to please probably account for rhetorical and orthographical errors. The title on the front page of the prospectus is "a glimpse in the mysteries and secrets of the treasure vaults of the ancient Spaniards." On the inside front is a picture showing an "old Mexican town near the Lost Bullion Mines." The United States district attorney elicited the information that this picture was reproduced from a photograph of a few old Mexican shacks near Silver City.

Cortez and the Mexican Conquest

Following are six pages of matter containing a rehash of what historians have had to say of the conquest of Mexico by the Spaniards, and giving in revolting detail torturing methods used by Cortez to make the Indians divulge their secret mines and treasure vaults.

The next subject has much to say about the marvelous richness of Mexican mines and the fortunes made from them without, however, mentioning the fact that the Mexican mines referred to lie several hundred miles south of Silver City and also that most of the fortunes were made by the legitimate application of English and American capital, and not by Spanish adventurers with wornout shoes.

A paragraph headed "A Lost Mine that is Famous in the Taiopa" tells of the Indians of the region selling rich ore when in need of necessities, and how a lady was presented with several lots of gold ore of fabulous value because of gratitude for her ministrations to an Indian when he was sick. She, nor anyone else, ever had persuasive ability sufficient to get him or his tribal companions to show them the source of the ore. The race is deteriorating surely. It is too bad Mr. Cortez wasn't around to help the old lady persuade the Indian, for from the accounts of his conquest he had persuasion down to a fine point.

The Mine Is Discovered

The climax has now been reached in the prospectus, and the sublime creation of the master's mind—the story of the discovery of the mine in all its romantic details—follows. The investor who could resist this story is to be congratulated on his lack of imagination. Small fragments of the story, shorn of their more picturesque flights of descriptive fancy, are as follows: "George Dubois, an old-time prospector, . . . has an extensive acquaintance with the customs and legends of Mexico. A son of Mr. Dubois . . . befriended a Yaqui Indian in many ways. . . . Young Dubois learned the story of the ancient mine on Bear mountain from the old Yaqui. . . . Also told the story of the massacre of the whites and evacuation of the country. . . . Young Dubois did not place much credence in story. . . . Dubois, Sr., at once recognized the old legend . . . and commenced to search for the lost mine. . . . Many weary days he searched . . . day after day, month after month, almost despairing of ever succeeding in his attempt.

"One day on the mesa opposite the gulch across from Bear mountain he found an old monument. . . . A little further down the mesa he found evidences and traces of what had undoubtedly been the habitations of the Spaniards. . . .

"To only a practised eye could these slight traces have been discernable, . . . it proved at once he was on the right trail. . . . Discovered evidences of an old dump. Close to the dump he found a small hole, almost covered with the accumulation of years. . . . The mountain on which the old mine is found is one of the largest in six chains. . . . It seems to divide the great mineral dikes that follow the continental divide, and is entirely covered with a mass of true fissure veins."

Scrub Trees, Lady Bugs and Great Mineral Dikes

Mr. Dubois, Sr., had such an intimate knowledge of and acquaintance with the customs of the old Spanish trouble-makers that the theory of reincarnation must be more than a mere theory. Perhaps his previous self even helped erect the monument referred to. Even to the initiated an explanation of what is meant by "the division of the great mineral dikes that follow the continental divide" is necessary. I infer that it means that all the great mines of the country owe their existence to this mountain, but I suppose I am wrong. The only thing I could see when down there that covered the mountain was a lot of scrub trees and lady bugs. The mistake of taking them for mineral veins was, of course, natural and excusable.

But the pamphlet goes on and executes a few further gymnastics which are exceedingly intricate.

"The geological characteristics of this section are limestone and quartzite traversed by dikes of intrusive rocks. Mr. Dubois has panned gold from almost every part of the mountain.

"The lost mine is entered through a very small hole, just large enough for a man to squeeze through. In a short distance a large chamber is entered, from which dozens of drifts and levels radiate. . . . The mine has only been partially explored for a distance of several miles. . . . Engineers estimate that when the old workings are thoroughly explored that perhaps there will be 12 to 15 miles of underground workings. . . . Large chambers are encountered where enormous wealth must have been extracted.

"The Spanish method of mining was perhaps the most economical the world

has ever known. They followed a vein wherever it led and burrowed like ants. Millions of dollars of previous ore was taken out by the Spaniards. The probabilities are they left the great bulk of their treasure when they abandoned the mine, and perhaps in some dark recess will be found the fortunes for which they labored so arduously. By their methods they could take only the highest grade of gold and silver ores, . . . by working the lower-grade ore . . . many times the millions that the Spanish secured can be taken out."

Work of the Imaginative Wildcatter

These three paragraphs from the prospectus are typical of the wildcatter, though few of them have the imagination of the author of this one. We have presented to us in it a few geological terms which the author of the prospectus has shuffled up until they look plausible to the layman. The mine is described as attractively as possible and methods of mining are touched on vaguely so that the impression may be created that the promoters know all about mining methods in vogue since Adam built him a dugout. The fact that the Spaniards secured millions is disposed of without effort, though in the entire pamphlet nothing appears as testimony to this fact. And herein is the bait concealed, for the promise is held forth that possibly enough bullion to sink a battleship, and all ready for market, will be found.

But in a discussion of mining methods there seemed to be a screw missing somewhere. In one place it was claimed that the Spanish methods were the most economical that the world has ever known, while in another it was practically stated that their methods were so crude as to admit of their taking only the highest grade of ore. Inconsistency is the keynote of this, as it is of many other lures of the wildcatter.

The geological reminiscences of the writer of this pamphlet are interesting in the extreme. They have been a source of great edification to me, as I hope they will be to others. We have "limestone and quartzites" designated as "characteristics," and without a pause he goes on to say the "characteristics" are traversed by dikes.

A careful survey of the "underground workings," a survey which embraced every part that man had ever penetrated, showed a total length of courses of less than 3000 ft. Probably this is wrong, as the "engineers" employed by the Lost Bullion rascals seemed to be able to stand in one place with a lot of crooked passages all around them and estimate distances and lengths without interrupting their other pipe dreams.

Future mining methods were not neglected by the promoters and we next have the entire proposition of future development disposed of in a few words:

"Two methods are presented to get to the vast bodies of gold and silver ore. One, . . . by driving a tunnel under the old levels . . . Another is to clear out the old workings . . . High values have have taken by the engineers . . . This confirms our opinion that Bear mountain is almost a solid mass of gold and silver ores . . ."

Truly a most conservative statement! To limit the orebodies to Bear mountain when the formation the ore is said to occur in covers the greater part of New Mexico and Arizona is to be modest in the extreme! The prospectus closes with a few choice remarks, laudatory in character, regarding the past performance and present judgment and integrity of the officers and directors of the company. We might possibly be trusted to believe that three "well known" engineers examined the property, each without the knowledge of the other, if a careful review of the published reports of these three engineers did not reveal the fact that they used the same samples to get all their assays from, for the results check to a cent.

Engineers' Reports Wonderful Literature

The first of these professional gentlemen takes the reader off his feet right at the start and produces a sentence that has, I truly believe, never been equaled. I quote it in full: "Geological Features —The geological character of this entire country and section is first class, being generally undulating and particularly accessible, being crossed with the country formation; with limestone and quartzite occasionally and intrusions of porphyry, andesite, trachyte, and other broken formations which are at all times encountered near one of the continental or other divides."

One must pause from sheer admiration after a comprehensive glance at the above. Does anyone know what a second-class geological character is? Verily I believe that no engineer—or bricklayer—could, with such naïve simplicity, go through the mental gymnastics necessary to call "accessibility" a "geological character" or bring in "undulation" in the same breath in such a manner as to instantly suggest a hairdresser! The works of Mr. Burbank of California are evidently but crude and embryonic attempts at productions of new species, for here we have a complete "geological character" "crossed with the country formation." The entire report at no place falls below the standard set in the opening sentence. The fissure veins of this property are evidently a new species and would make a most valuable addition to the Bronx zoo. They are evidently active, "from time to time running in various directions." In a burst of confidence we are also told that the property is mineralized with a limestone dike.

The engineer who wrote this report when confronted with it and asked to explain in court stated that he never made the report as published by the Lost Bullion Spanish Mines Company. He made this statement over one year from the time the report was published. He did not furnish a copy of his report as originally written. The other two reports were of the same type as the first.

Trial Showed Interesting Facts

The trial instituted by the postal authorities brought to light a number of things. A few of the more important ones are, in brief, as follows: Mr. Dubois stated under oath that he had never been to Old Mexico except for one short trip to Juarez, just across the line from El Paso, Tex.; that he had no knowledge of the customs of the ancient Mexicans or Spaniards; that the story recited in the prospectus of the search for the mine was false, and that he knew the "old mine" was a limestone cave located by a prospector named Dorsey some 20 years before. Asked if the sketch map showing the underground workings was a correct one, he said "the entrance resembled it somewhat but otherwise did not resemble it in any way."

He said further that he accompanied two of the engineers "who had no knowledge of each other's presence" and they examined the mine together. He acknowledged that all his communications were pretty "strong," but said that he had been told by the officers of the company to write "strong letters" which would help them sell stock.

These statements and many others were made in court by the principals in this little comedy and all were absolutely contradictory to the statements originally published for the purpose of exploiting the property. In order to keep the influx of money from investors at a steady point letters were issued from time to time reporting marvelous new discoveries on the property. One or two of these letters reported the finding of some 450 lb. of rich silver-gold bullion. Examination by the prosecution showed that this bullion was nothing but a lot of lead drippings which had been gathered up around the furnaces of the Silver City smeltery.

Company Reorganized in Spite of Evidence

In the reorganization of the affairs of the Lost Bullion Spanish Mines Company, a reorganization which consisted merely in gathering together wreckage, certain Eastern men who had been victimized by the promoters of this company, assumed control under the corporate name of the Oro Moneda Mining Company. These gentlemen, still entertaining the belief that they held a

property of great value, in spite of all evidence to the contrary, undertook to continue the work of development.

The case of the Lost Bullion Spanish Mines Company furnishes an illustration of the blindness which seems to afflict shrewd business men when they are confronted with a mining venture so presented as to show prospects of enormous profits and surrounded by a roseate halo of romance. Even a superficial analysis of the quotations from the literature and testimony of the promoters of the Lost Bullion company will show the conflicting and contradictory evidence and may well cause one to wonder why so many people bought their stock. It may also be seen that there is nothing in all the resolutions against wildcatting that can be drawn that can prevent the promoter of just such an enterprise as this from issuing the same kind of periodical statements. It is publicity of fraud and proper preventive legislation against it that are needed. This somewhat historical and not altogether coherent résumé is offered as a small contribution in this direction.

The Cooperative Smelting Works at Johannesburg

The Coöperative Smelting Works is an institution founded last April by the Johannesburg Chamber of Commerce, to treat the various residues which could not be profitably treated by the separate mining companies on the Rand.

These residues were disposed of to small local dealers, and as it was felt that such trade could act as a cloak for traffic in stolen property, it was judged best to eliminate it far as possible.

About 400 tons of material per month are treated at this works, most of which goes through a small blast furnace of 30 to 40 tons capacity per day. There is also a pan furnace and a cupel furnace. About 10 white men and 25 natives are employed.

Club Houses for Mine Employees

The club house built by the Cleveland Cliffs Iron Company at Gwinn, Mich., shown in the accompanying illustration, is one of the latest and most modern buildings of this kind, owned and controlled by a mining company. It was built last year and is in keeping with the philanthropic spirit of this company. The building is equipped with shower baths, swimming pool and bowling alleys in the basement. The basement is divided so that one side is for the use of men and the other side for the use of the boys. The swimming pool is common to both but can be used only by one or the other at a time. When the boys are using the pool, the doors connecting with the men's division are closed, and when the men are using the pool, the boy's compartment is closed. In this way they are entirely separate. The same feature prevails in all the departments of the building.

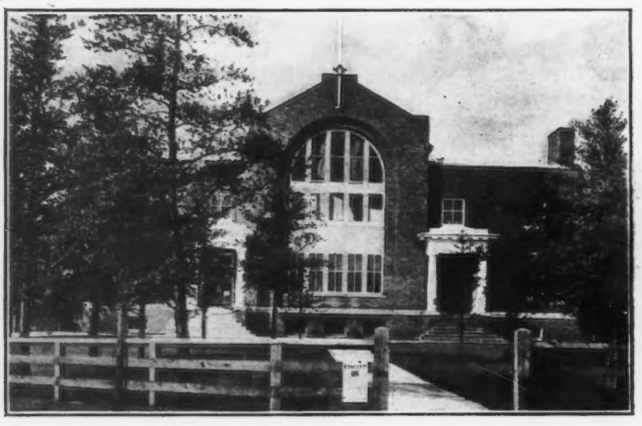
The first floor has billiard rooms, library, smoking rooms and ladies' parlors. The second floor has a gymnasium and may be used as an auditorium for entertainments of various kinds. There are also a number of classrooms on one side of the auditorium and on the opposite side is a large kitchen from which refreshments can be served. There is also a furnished apartment for the attendant and his family.

Membership Fees and Attendance

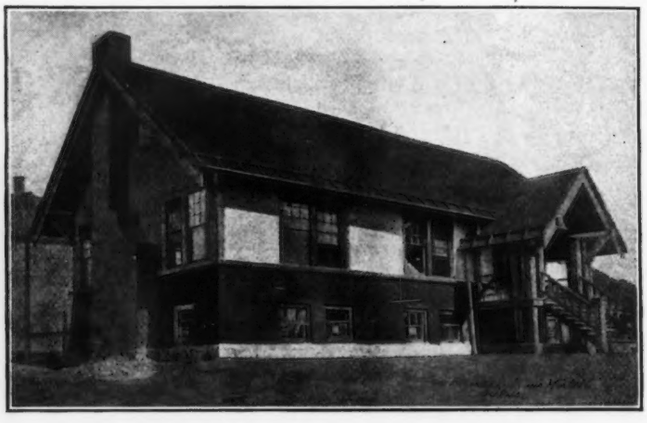
All of the employees of the company who live near enough to patronize this club are considered members and are charged 25c. per month as club dues. No class distinctions are recognized. The residents of the town who are not employees of the company may become members by the payment of 50c. per month. Boys whose parents are residents of the village and not employees of the company may become members by paying 10c. per month. No membership fee is charged for girls and women. There are a number of rooms set apart for girls' and women's clubs and certain days are set apart for them in the gymnasium.

It is interesting to know that the daily attendance of the club is about one hundred, while special attractions are given at intervals at which the attendance is much more, thus raising the average far above one hundred. Newspapers of a number of foreign languages are on file in the reading room.

The Baltic Club House, near Palatka, Mich., was built by Pickands, Mather & Co., and while it is not as large and pretentious as the one built by the Cleveland Cliffs company, yet it is serving the purpose as an attractive place for the employees of the company to assemble and spend a pleasant evening. Here no club dues are charged, all the departments being free to all the employees of the company. The only charge that is made is for the night school, in which there are 30 or 40 students taking lessons in English. A charge of $8 for 40 lessons is paid to the teacher who conducts these classes. This building has a billiard table, reading room, both tub and shower baths, bowling alley and barber shop. The building cost about $10,000. The daily attendance is 50 to 60 and the miners seem to show their appreciation of the efforts of the company in trying to better their conditions.



Club House at Gwinn, Mich.



Baltic Club House, Near Palatka, Mich.

At the docks of the Pittsburg & Conneaut Dock Company, at Ashtabula, Ohio, Sept. 3, four Hulett 15-ton machines unloaded 35,855 gross tons of ore from four vessels, working day and night shifts. The total average time for the four machines from start to finish was 20 hours 51 minutes. The total average lost time from shifting of vessels and machines and other causes was 1 hour 41 minutes. The net working time for the four machines was thus 19 hours 10 minutes. About 90 per cent. of the ore was taken out by the machines independent of the shovelers, and the work of the latter consisted in shoveling the small amount of the ore from the corners and piling it under the buckets.

Value of Geological Work in Limestone Regions

Considered Sufficient at Bisbee to Study General Geologic Conditions. Conditions at Highland Boy Mine Call for More Detailed Information

BY CLAUDE T. RICE

The importance of the study of the underground geology at mines is fast becoming recognized. One of the first things that was done at Cananea when the merger company began to work the mines was to have a geological study of the district and the mines made by S. F. Emmons and J. M. Boutwell. The Calumet & Arizona company, at Bisbee, Ariz., has long been studying the geology as revealed in the mine workings, in an endeavor to gain knowledge that will assist in the finding of orebodies. Recently, the Copper Queen company, also operating at Bisbee, has had J. M. Boutwell make an exhaustive study of the Bisbee camp, and now this company has a regular geological department as an addition to its engineering force. Practically every large mining company now has a study made of its ore occurrence to aid in the finding of new ore, but it is mainly at mines where the ore occurs in limestone that it is thought necessary to keep a force of men constantly studying the geology as it is revealed in the mine workings.

At Butte, also, where the ore occurs in a granite "country," the geology has been extensively studied, but mainly on account of the litigation which has so long accompanied Butte mining. This geological work is still continued, but on a much less pretentious scale than formerly. Probably the first company operating porphyry copper mines that has kept a man constantly at work studying the geology of the ore occurrence is the Detroit Copper Company, but it should be added that the ore occurrence there is much more complicated than at the more famous porphyry occurrences at Ely, Nev., and Bingham, Utah. This geological work has proved so successful that the work of studying in detail the geology of the ore occurrence at the Pilares mine, of the Moctezuma Copper Company, at Nacozari, Mex., is soon to be begun.

Too Much Stress Laid on Hypotheses

The great trouble with much of the geological work is that, as in law, too much weight is given to precedents or hypotheses, for that is what most of the so-called theories about ore occurrences are. Geologists seem to be constantly trying to back up their opinions with reference to other occurrences until geological articles and reports are beginning to assume the appearance of briefs. Collation of geological observations is well enough, but can be carried too far with the result that theory, as opposed to actual observation, becomes too important in the mind of the young geologist. This should not be, for with his scientific knowledge he should acquire the "nose for ore" much more quickly and to a better degree than even the old follower of the mines.

Methods of Recording Geological Information Vary

At Bisbee, the Calumet & Arizona and the Superior & Pittsburg companies use an ordinary loose-leaf notebook for recording geological notes on the same page as the sketches made underground. Later the geology is drawn in on the geological maps at the engineering office from the field notes and sketches.

At the Copper Queen property the mine is divided for convenience into three sections, the maps of underground workings of each section being kept in a separate map book for use underground. These maps are printed on sensitized cloth, a negative of the mine map being used in doing the printing, so that, on the sheets of the underground geological book, the workings are shown by the blue lines on a white background. The sheets are arranged in the books so that the 100-ft. level of area *A* is followed by the sheet showing the 200-ft. level of area *A*, and so on, to the lowest level of the mine. The size of the loose-leaf pages is 9¼x11¼ in., and a scale of 80 ft. to the inch is used in mapping.

Idea at the Copper Queen is to Gain General Knowledge of Geological Conditions

While this might seem a rather small scale, it is said to be ample to allow the representation of as much detail as is considered desirable. An area 750 ft. wide by 900 ft. long is shown on each sheet, so that the conditions over a rather large area are in sight to aid the geologist in understanding the general geologic conditions about the mine. Reference to maps of sections above and below aids materially in understanding these.

The object of this system is to give the geologist a general idea of the conditions in the ground and to keep him from devoting himself to too close study of detail. The geologists have already succeeded in finding two new orebodies, the object at Bisbee is, however, rather to find areas where orebodies are liable to occur rather than to attempt to determine the probable position of specific orebodies.

Other Bisbee Companies Employ Slightly Different Methods

Probably this policy of showing only the major points of the geology is quite correct in Bisbee, for only the general relation of the ore occurrences to intrusions of porphyry is recognized. But the failure to study and map the minuter points, such as the amount of fracturing prevailing at certain points, the direction of the minor slips, the degree of metamorphism and the amount of silicification, may account for this lack of knowledge. Still the Calumet & Arizona and the Superior & Pittsburg geologists who have done the mapping with somewhat more detail for a much greater time than the Copper Queen geologists, have failed to note any direct relation between the orebodies and the minor geologic phenomena.

It must be remembered, however, that W. J. Gohring, superintendent of the first two companies named, and who has probably found more ore at Bisbee in the last five years than any other one man, says that he goes more by the looks of the ground itself, in prospecting for new orebodies, than upon the geologic conditions. In other words, his study of the geology of the workings has caused him unconsciously to observe and appreciate the importance of conditions, seemingly of minor interest, which influence the ore deposition.

Transit Stations Used as Base for Plotting

The geologic map books used in the Copper Queen are carried underground in the specimen bags, and in order to protect the maps, the books are fitted with a flap of soft leather that comes over the top and keeps out dirt. The geologists carry acetylene lamps so the maps do not get greasy. As the sheets shrink about 2 per cent., due to the washing necessary after being printed, the observation stations are plotted from transit points so that no cumulative error is introduced.

In case that it is necessary to show the geology with fuller detail than is possible on the map, or when the observations call forth some remark, these notes and sketches are recorded in a loose-leaf notebook, the leaves of which are indexed in a card system under the number of the sheet on which is shown the station where the observation in question was made.

Geologic Sheets Serve as Cross Reference Index to Specimen Collection

The specimens collected in the course of the geologic work are given running numbers and filed in the specimen cabinets. To facilitate the comparison of specimens of the same nature but from different parts of the mines, the specimens are indexed under the name of the rock or under the heading of the thing that they were taken to show. On the geologic sheets the place where each specimen was taken is shown, so that these sheets serve as a cross-reference index to the specimen collection. On the card accompanying the specimen, the name of the rock and short remarks are noted; reference is also made as to where in the filing case fuller notes about it can be found. Finally data from the geologic sheets are transferred to the geologic maps of the levels.

In the Copper Queen system the areal-survey methods, adopted by the U. S. Geological Survey are employed underground, but it is to be questioned whether in this method too much stress is not laid on projecting geologic conditions, and whether detailed studies are not of much greater value than those which take into account chiefly the more evident geologic phenomena. Is it not far better for the economic geologist to be inclined to creep when underground rather than to jump as is the procedure in areal-geology work?

At the Highland Boy Mine Especial Attention Is Paid to Detailed Geologic Observation

At the Highland Boy mine, at Bingham, Utah, the system of geologic work is planned and the work performed with especial emphasis upon close observation of the minor details. Moreover, realizing that the conditions in the stopes are fully as important as those on the levels, except for the fact that most of the prospecting work is confined to the levels, geologic maps are kept showing the conditions on each floor of the stopes throughout the entire mine. The information is easily obtained, and the gathering of it gives much more chance to study the geologic conditions immediately surrounding an orebody than is obtained when conditions are mapped in detail only at those points where the levels intersect the orebodies.

Where the country rock is limestone this geologic work in the stopes is easily done, for on account of the characteristic irregularity of the occurrence of ore, it is almost imperative to use the square-set method of mining. This insures that, when on account of disclosures on the lower levels it becomes advisable to prospect more thoroughly portions of the upper levels, this reprospecting can be done at no markedly greater cost than if the mining had not already extended to deeper levels. In square-set stoping the geology can be conveniently worked out with floor maps and recorded on cross-section paper.

Stope and Level Maps Kept Separate

At the Highland Boy mine two sets of field maps are used: One set comprises the stope maps on which the geology of the stopes is worked out; the other, the level maps on which the geology revealed in the levels is shown. The geologic information from both is later transferred to the level and floor maps which, as they cover a much larger area than do the field maps, are upon a different scale. The same scale is used on the geologic maps as on the mine maps, the map base of the former being traced from the mine maps.

The geologic stope maps are kept in tenth-scale, cross-section note books (Kueffel & Esser No. 376). These are also used for recording the floor plans of the different stopes. The same zero set is used in both sets of maps so that the dimensions of different floors of a stope can be checked readily by comparing the two sets of plans. But in the floor maps of the stopes a scale of 50 ft. to the inch is used, while in the geologic stope maps the scale is 25 ft. or five sets to the inch. With this scale the geologic information from the stopes can be plotted with as much detail as is desired.

Conventional Signs Used to Indicate Various Conditions

A legend consisting of letters to represent the different rocks and a few symbols to indicate the manner of the occurrence of the ore is used to represent the geology. By means of numbers reference is made to the notebook in which fuller notes are kept but the policy is to give as much information on the maps as is possible and to use the notebook only when it is absolutely necessary.

Points where specimens are taken are indicated by a diamond, while the point at which an observation is made is designated by a cross. This latter is done as it is sometimes necessary, owing to the crowded condition of the map, to put data regarding an observation at a distance so as not to complicate the map; in giving the strike and dip of a fault this must occasionally be done. Whenever possible the pitch and the direction of the striations on the fault planes are also given. In all cases the true and not the magnetic bearings are recorded.

Loose Leaf Notebook Preferable

There is a great deal of wear on the geologic stope books, and while the books now used seem to stand it fairly well, it would be much better if loose-leaf pages, similar to those in the level books, were used. This paper would have to be marked with cross-section ruling for this kind of work.

The observations made on the levels are recorded on loose-leaf sheets carried in an ordinary loose-leaf notebook that fits in the specimen bag. These sheets are 11¼x8½ in., and as a scale of 30 ft. to the inch is used an area 200 ft. wide by 300 ft. long, or six 100-ft. squares, can be mapped on a sheet. These sheets are cut from rolls of Keuffel & Esser Paragon paper No. 71, medium weight, rough finish. As the sheets are cut from rolls they have a tendency to curl but this is corrected by placing them while moist in a heavy book to dry. The rough or egg-shell finish is preferred as it is easier to plot on it than on the smooth-finish paper; the triangles do not slip so easily.

Scale Adopted Suitable for Mapping Details

The scale of 30 ft. to the inch used on these sheets allows the geology to be shown in detail. This, at the Highland Boy mine, is essential as the geologic work already done shows that the shape of the oreshoots seems to be dependent upon the composition of the limestone beds and also upon the amount of premineral shattering to which the rocks were subjected. While as J. M. Boutwell states, the porphyry is the source of the copper, the orebodies are not always in direct relationship with the porphyry intrusions. Intrusions of porphyry in many instances do have an influence upon the ore occurrence, and even upon the shape of the orebodies. In places the porphyry is not even in contact with the ore at any point in the stope where such an influence appears to have been exerted. Consequently, porphyry intrusions also have to be mapped with a good deal of accuracy. The geologists work out the lithology with a good deal of care, showing on the maps marbleized limestone, silicious limestone or calcareous quartzite, quartzite and mineralized limestone, and the condition of the ore, whether oxidized or sulphide.

Loose Leaf Sheets Serve as Basis in Working out Geology

These loose-leaf geologic sheets are given running numbers when they are made, and are indexed according to the level, the map of which they form a part. Taken together they do not show the whole of a level but cover only the drifts, crosscuts and other developments. They serve merely as working maps from which to transfer the geology, as it is worked out, to the geologic level and floor maps where the geologic conditions throughout the level are shown continuously, as far as the underground work has revealed them.

Care Used in Labeling Specimens

Only the geologic sheets which are to be used during a day are taken underground, and generally this work is confined to the area covered by one sheet.

The geologic sheet or sheets come first in the loose-leaf notebook; next comes a heavy cardboard to serve as a backing while the position of specimens is being plotted; and finally a number of blank sheets of cheap thin paper used in wrapping the specimens. These sheets are given running penciled numbers so that the specimens are labeled by the wrapping paper.

One number is put in the center of a sheet and one in one corner so it can be easily torn off and used to mark the specimen when it is later unwrapped for determination. To guard still further against confusion the number of the specimen is marked on it with red pencil when it is taken. The specimens are given running numbers with an additional "prefix," of the sheet, i.e., if the 725th specimen was taken on sheet No. 11 it would be labeled 11-725. All specimens are taken to surface for final determination.

Specimens Must be Taken Frequently

The points where specimens and observations are taken are measured by tape from transit points, and so complex is the geology in many places that specimens have to be taken every three to five feet. By means of a scale which he carries underground with him the geologist locates on the map the position of taking the specimen, marks the point with a diamond-shaped symbol and writes in lead pencil the number of the specimen. He then wraps it in the sheet of paper which he tears from the loose-leaf book, after having marked in red pencil the number on the rock itself. In order to facilitate the taking of measurements the tape used by the geologist is fitted at the end with a hook for fastening into the hole in the spud at the transit point from which the measurement is taken; and to aid in handling it the tape is carried on a cross-arm reel, one arm having a loop on it to slip over the handle of the reel and keep the tape from uncoiling when it is hung up while the plotting is being done.

Different Colors Represent Various Rocks

Later, in the office, after the final classification, the specimen numbers are inked in on the geologic sheet with the color of waterproof ink used to designate that rock. All slips, faults, and contacts are indicated by lines in the color of ink designating the rock in which they occur. By means of arrows the direction of the horizontal movement along a fault plan is shown while the direction of the vertical displacement is shown by means of a dumb-bell symbol, the bar being in the direction of the vertical movement.

Geologic Sheets Give Detailed Information

By means of the color legend the same number of distinctions is made on the stope maps, as with the symbol legend. When there is ore in the walls of a working, this is shown by cross-hatched lines in the ore color, while a mineralization of limestone that is too low in grade to be mineable is shown by dots in the color of ink used to designate ore. Reference to the assay plans reveals the assay value of the mineralized areas. Sets silled off on ore are outlined with the color of ink used to represent ore, while filled sets are cross-hatched with red ink.

In short the geologic sheets are made to show as fully as possible the condition of the mine and the geology in the worked portions, but in no case are the geologic conditions assumed for more than 11 ft. beyond the point of observation, that being left the eye to do when one is theorizing on the ore occurrence. The geologic maps simply show things as they actually are known to be. The specimens are kept in boxes, all those from the area covered by one sheet being kept together.

Same Legend Used on Plan Maps as on Sheets

On the geologic plan maps of the levels the coloring is done with crayons but the same color legend and symbols are used as on the geologic sheets. No assumptions as to the geology are made and, in fact, at the Highland Boy mine projecting is only done while drawing sections to show geologic conditions through certain parts of the mine.

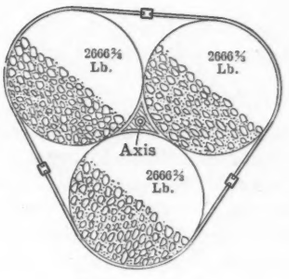
The scale of these geologic maps of the stopes and floors is 50 ft. to the inch. They are drawn on tracing cloth, the glazed side being used in order that alterations and additions can be made without injury to the maps. The coloring of the map is done on the reverse side of the cloth so that there is no smudging of the drawing when erasure becomes necessary.

Present System a Natural Growth—Satisfactory Results Achieved

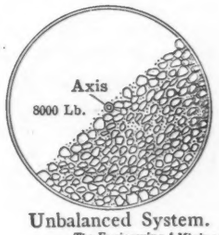
While the geological work at the Highland Boy mine has been carried on for over five years the recording of the geologic data with the detail so charactertistic of the present work was only instituted after the earlier work had shown the advisability of this. Already the accumulation of geologic evidence has shown a relationship between the chemical condition of the limestone beds and the shape of the orebodies and a general relationship between the porphyry intrusions and the orebodies. It is, therefore, probable that finally, after the detailed work has progressed farther, the hypotheses in regard to the ore occurrence at the Highland Boy mine will become true theories. If this be accomplished it must be attributed to the fact that all available data were collected and not only such as seemed important, because of some hypothesis of ore formation.

The Multiple Tube Mill

With the idea of reducing the power required for driving tube mills and at the same time maintaining a maximum grinding capacity, the J. R. Alsing Company, of New York, has designed a multiple tube mill in which the load is distributed around the center axis. This design also retains a large top surface of pebbles for grinding. The accompanying illustrations offer an opportunity of comparing the balanced arrangement of the multiple tube mill with that of the standard tube mills, in which all of the charge rests below the axis of support and a large amount of power is required to rotate. The multiple tube mill has the advantage of being more easily transported and



Balanced System.



Unbalanced System.

The Engineering & Mining Journal

Two Systems of Tube Mill Construction

erected, since each of the cylinders is smaller than the one required for the unbalanced system.

Water Power in Northern Ontario

The Ontario Department of Lands Forests and Mines has been for some time collecting data regarding the water power available in the northern parts of the Provinces. The surveys included the main tributaries of the Moose, Albany, Winnipeg and Rainy rivers and it appears that there is available an aggregate of 2,000,000 h.p. These waterpowers are distributed over a distance of 600 miles, and some of the larger ones have a capacity of from 50,000 to 100,000 h.p. These provide an immense reserve of power, which may be used for the electrification of a part of the Grand Trunk Pacific railway.

A Process for Saving Wastes in Smeltery Gases

Finely Divided Slag Treated While in Suspension with the Smeltery Gases, Resulting in Solution of the Bases as Thionates and Sulphates

BY GEORGE C. WESTBY*

Of late years the disposal of smeltery smoke has been of vital interest to agriculturists, foresters and smelters wherever farming, forestration and smelting were carried on in the same locality. The problem has been earnestly attacked in some of the oldest smelting centers of the world, and yet it has been only partly solved. Some of the smelteries of the United States have carried on much experimental work with more or less success. No plan, however, has been generally adopted, because each locality usually has a different problem.

Objections to Various Remedies

The most feasible way of disposing of the sulphur dioxide is to convert it into sulphuric acid, but, here again, local conditions are the controlling factors. A common proposal is to convert the sulphur dioxide into sulphur by passing it through incandescent coke, but here the cost is a serious consideration. Treatment with magnesium hydrate, with lime and iron, have all had their exponents, but all have failed on account of the cost of the reagents. The flue dust of the smoke has usually been well eliminated in all these cases, but it is an expensive saving. Long flues and flue-dust chambers have proved fairly efficient in preventing the dissemination of the flue dust, but it is the sulphur dioxide which escapes that is dangerous to vegetable life.

Leaching Slag with Sulphurous Acid

One of the earliest plans for preventing the contamination of the air by sulphur dioxide was to pass the sulphurous smoke through coke or scrubbing towers through which water was passing, thus forming a solution of the gas in water. This method failed on account of the extreme difficulty of making a complete absorption and as it merely transferred the arena of toxic action from the air to the water. It was while working on this method in a physical testing laboratory at a copper smeltery near Salt Lake City that the idea occurred to me that the sulphur fumes might be combined with the bases of the slag, the flue-dust eliminated electrostatically and the cost of the necessary plant and its profitable maintenance be more than covered by the savings from the dust and by the copper and other metals extracted from the slag.[1]

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[1]Acknowledgments are due S. S. Sorensen and E. P. Jennings for effective work on this process.

Fine Shower of Molten Slag Falling through Sulphurous Acid

It did not seem practicable to use sulphuric acid and the 0.5 to 1 per cent. solutions of SO_2 which were obtainable from scrubbing towers were not recognized as of sufficient strength to act on the slag. A molten stream of slag pouring from a reverberatory furnace suggested the thought that if a fine rain of molten slag was brought into contact with a weak solution of sulphurous acid, a sufficiently rapid action between the particles of the hot slag and the SO_2 and H_2O would result.

Many preliminary tests were made with solutions of SO_2 varying in strength from 0.5 to 1 per cent. on slag passing through 100 mesh and heated by means of a lamp. The imitation of the ideal conditions was not close, but these experiments proved that the copper could be saved, and that the sulphur of the SO_2 would readily combine with the bases of the slag. The tests also indicated a method for permanently removing sulphur from any kind of obnoxious circulation, the principle of which depended on the precipitation of basic iron sulphates as acidulation decreased and oxidation increased.

Experiments with Slag Wool

In the course of the experiments molten slag was blown to slag wool pneumatically or by steam, and then treated with sulphurous solutions. The shredding of the slag oxidized a great part of the copper and rendered it easily soluble in the sulphurous solution. The fiberized slag was also physically adapted for rapid decomposition. Unfortunately the spherules formed with the wool were not so susceptible to treatment, yet the following experiments indicated the feasibility of an economic solution of the smoke problem.

The laboratory experiments representing the climax of the first tests were carried out in a percolating arrangement consisting of a superimposed, inverted bottle containing the solution and a layer of slag in the lower part of a second inverted bottle with the bottom removed and a filter on the neck through which the solution drained to a sump.

This device made it possible to keep the solution continuously percolating through the slag and also to bring about the reaction, $Fe_2(SO_4)_3 + SO_2 + 2\,H_2O = 2\,FeSO_4 + 2\,H_2SO_4$. One hundred grams of slag wool with adherent spherules were used in each case, and 2000 c.c. of solution. Some samples contained more spherules than others, and in other cases the copper was more oxidized. As an illustration results of two tests are given.

Using a 1 per cent. solution of SO_2, experiment showed, after the third day, an extraction of practically all the Fe and 63.1 per cent. Cu. At the end of the sixth day the copper extraction was 94.3 per cent. The same per cent. solution of H_2SO_4 was again used with the result that at the end of the second day 100 per cent. of the iron was extracted and 52 per cent. copper, while at the close of the sixth day 98.4 per cent. of the copper was extracted.

The results, while showing the possible applicability of the disintegrating power of dilute sulphurous-acid solutions on slag wool, still left open the questions: (1) of a simpler or more positive means of decomposing the slag and (2) a cheap and efficient method of precipitating the copper.

Experiments on Slag in Lump Form Unsuccessful

Tests were made on slag wool with 0.75 per cent. solution of SO_2 agitating the mixture in an ordinary copper flask, to determine its solubility. They proved that the decomposition would be readily effected by agitation, but the cost of mechanical stirring on a large scale, in view of the conditions which then obtained, was a factor to be eliminated, for it was an insistent fact that the margin for profitable treatment was small.

As a simplification of the process, the use of slag lumps was considered in place of the ground or shredded material, but after experimental examination we were compelled to reject all methods using slag in mass, for three reasons: (1) the lumps were unchilled and consequently but slightly soluble in comparison with the chilled slag, (2) gelatinous silica formed over the surface of the lumps and so prevented further effective action of the sulphurous acid on the slag, (3) it was utterly impracticable to draw the gases through a mushy mass of partly dissolved slag, where the gases are designed to form the active sulphurous acid in direct contact with slag, or, as in one suggested process, sulphuric acid in the presence of steam at 400 deg. Fahrenheit.

The final working plan consisted in keeping the finely divided slag, wetted or suspended in water, in continuous

agitation and exposed to the direct action of the hot sulphurous and sulphuric gases as the material fell or was carried through the smoke. This plan was found effective in bringing about the desired chemical decompositions. It introduced the best economic and chemical conditions possible.

During the inception of the process the question of precipitating the copper at a low cost from dilute solutions was a troublesome one. The difficulty was finally overcome by producing a precipitant in the solution from the slag and the smoke we were treating. The only factor needed in the completion of the separation was the introduction of a few degrees of heat to the already hot solution. The general form of the precipitant is an iron thionate or, more accurately, a mixture of thionates.

At this stage the process resolved itself into the following essential features:

(a) The treatment of the wetted, finely divided slag during its agitation or motion in the current of sulphur gases.

(b) The precipitation of the copper or lead by means of thionates or thionites developed in the original liquor.

(c) The separation of silica and of iron, the latter as copperas, from the original solution, effected by the regulation of the temperature, the acidity of the solution and evaporation.

(d) The formation of an insoluble basic iron sulphate from the sulphosalts of iron present in the solution, in those cases where it is not desired to separate iron sulphate as a by-product.

(e) The separation of zinc as a by-product after the elimination of iron and silica.

(f) The alternate use of matte and ores in place of, or with slag.

(g) The disintegration of the slag by direct action of the smoke in the presence of water occurred not only with the solution of the iron and of the bases, but also with pseudo-solution of the silicic acid which had arisen from the decomposition of the silicates.

This pseudo-solution is easily maintained in the slightly acid solution and does not interfere with the formation or solution of the iron compounds or other combination of bases with the sulphoacids during the progress of disintegration.

Polythionates Are Always Produced in the Decomposition of Slags and Mattes

The retention of the greater part of the lime in solution is attained in the formation of thionates of lime. These compounds in many respects, particularly as precipitants, act in the same way as the iron compounds. Ordinarily they are of less importance than the iron salts, and in the following discussion, iron is taken as a representative of the thionate combinations.

The polythionates are always produced together with sulphites and sulphates in the decomposition of slag or matte. Their formation and preservation depend on the physical conditions, chemical constitution of the smoke and liquor and the nature of the material treated. A comparatively low temperature and concentration favor their genesis, the presence of sulphites and free sulphur encourages and brings about their development and the material used determines in part their form. The polythionates are unstable and the higher thionates are easily transformed into other thionates. For example: a trithionate breaks up into a dithionate and tetrathionate as in the equation:

$$2\ FeS_3O_6 = FeS_2O_6 + FeS_4O_6$$

But the shifting may still continue and the compounds formed be decomposed in accordance with the equations:

$$FeS_2O_6 = FeSO_4 + SO_2$$
$$FeS_4O_6 = FeS_2O_6 + 2\,S$$

From the decompositions the following combinations may result:

$$FeSiO_3 + H_2SO_3 = FeSO_3 + H_2SiO_3$$
$$FeSO_3 + S = FeS_2O_3$$

The conditions present may also induce another course of reactions which in most cases predominate over those just given and may be expressed in the equations:

$$2\,FeSO_3 + SO_2 + O = Fe_2(SO_3)_3,$$
$$Fe_2(SO_3)_3 = FeS_2O_6 + FeSO_3.$$

Ferrous Sulphite an Important Primary Product

Ferrous sulphite is the most important primary product, but almost instantaneously in the proximity of the excess sulphur dioxide and free oxygen, ferric sulphite is developed and is made apparent in the solution by its deep-red color. Some of the ferrous sulphite passes directly into ferrous sulphate and there is also a direct combination between the sulphuric acid, originally present or derived in the smoke, and the iron of the slag. In our experiments a little less than one-third of the iron of the slag appeared in this latter combination.

In very hot solutions the proportion of sulphate is greatly increased and the polythionates begin to disappear in the manner indicated in the general equation:

$$MS_nO_6 = MSO_4 + SO_2 + (n-2)S.$$

Another phase of the process is brought out when oxidized ores are to be treated. The general treatment of the smoke with slag is the same, but a higher temperature in the absorbing apparatus is encouraged and a change in the method of circulating the solution is made.

The oxidized sulphates produced in the reactions between the smoke and slag are used in the development of solutions strong in H_2SO_4 for the extraction of metals from the ore, and transitory production of polythionate acids is induced by the interpolation of reagents to form them. These acids rapidly change in accordance with the equation:

$$H_2S_nO_6 + H_2O = H_2SO_3 + H_2SO_4 + (n-2)S.$$

Copper Recovered in Cuprous Sulphide

The principal source of the H_2SO_4, however, is the reduction by SO_2 of the oxidized iron sulphate solution derived from the slag treatment, or expressed in symbols:

$$Fe_2(SO_4)_3 + SO_2 + 2H_2O = 2FeSO_4 + 2H_2SO_4$$

The oxidation of the ferrous sulphate originally formed is brought about by exposing the acid smoke liquor to atmospheric action or allowing it to fall through air.

In the progress of the method, precipitation of copper dissolved by or introduced into the slag solution, is effected by the liquor itself, either in the absorbing apparatus or in a separate tank. The chemical combinations of the copper are as uncertain as the ever-changing thionates. The copper may appear in the solution in any or all of the thionate combinations or in the form of a double salt. In any case precipitation of copper as cuprous sulphide will occur in a heated solution:

$$3FeS_4O_6 + 2CuSo_4 = Cu_2S + 7SO_2 + 3S + 3\ FeSO_4.$$

Under some circumstances low-grade matte might be used either with or without slag or other material. In this event with the use of oxidized "smoke" liquor, hydrogen sulphide would be generated which would serve either as a precipitant for copper or be converted into pentathionic acid and, in part, transformed to sulphur and water in accordance with equation:

$$10\ H_2SO_3 + 5\ H_2S = 3\ H_2S_5O_6 + 12\ H_2O,$$
$$H_2SO_3 + 2\ H_2S = 3\ S + 3\ H_2O.$$

The copper and other metal contents present in the matte would, of course, remain as concentrates in the treatment chamber, augmented, where copper solutions have been developed, by the sulphide of copper derived from hydrogen sulphide or thionous precipitations. The methods presented for the segregation of the copper are applicable also to the concentration of lead from metallurgical products. We have not carried our experiment so far with lead product as with copper product and therefore in this paper deal prinicipally with copper. The constituents of a "smoke" solution are in general the same for any slag; the most

important, aside from those already referred to, are silicic acid and iron.

The colloidal silicic acid, occurring in the slag solution, readily separated in gelatinous masses after the solution had passed from the treatment chamber and had become cold and almost neutral. Various inert substances such as powdered charcoal accelerate the separation. The acid can be retained in solution, however, by keeping the liquor moderately acid or, if this is undesirable, by the addition to the neutral solutions of minute quantities of alkali. The latter solution becomes gelatinous on heating or on standing for some time.

The iron in the slag solution could be recovered as green vitriol, which in many places would make a valuable asset as a by-product. It could be obtained by simple atmospheric evaporation and re-solution is a minimum of hot SO_2 charged water, with deposition of the ferrous sulphate crystals on cooling and further evaporation; or by evaporation of the supernatant liquor decanted from the silica.

Iron and Sulphur Removed by Spreading Solutions over Large Areas

Where local conditions eliminate the consideration of iron vitriol as a by-product and demand only the elimination of the sulphur in the smoke, we allow the liquor to become almost neutralized in the absorber, then either bring about a precipitation of basic iron sulphate in a tank by means of aëration and heat, or, preferably, spread the liquor over waste ground and produce precipitation or separation by atmospheric action, evaporation and oxidation, of course, occurring at the same time.

The basic sulphates of iron developed are insoluble in water and thus the sulphur is changed from the avidly dangerous form in which it occurs in the smoke into combinations of inert substances. The basic sulphate is formed in the presence of excess air and moisture as shown in the equation:

$$4\,FeSO_4 + O_2 + 2\,H_2O = 4\,FeSO_4(OH).$$

Along with the deposition, the decomposition of polythionates occurs with the separation of free sulphur and the development of ferrous sulphate which changes further in the manner indicated in the above equations.

The silicic acid in this case on evaporation becomes dehydrated and remains on the ground as silica. Often zinc is an important constituent of a slag. It occurs in the solution in its final form as a sulphate and can be separated from the insoluble mass of basic iron salts, calcium sulphate, silica, sulphur, etc., formed by evaporation, by dissolving its salt in water. The metal may then be recovered by any of the known methods. The flue dust is completely removed, as the smoke is brought into contact with the surfaces of wet and porous slag or other materials, and its contents are concentrated along with those from the material used in the smoke absorber.

The results obtained indicate that commercial economy is secured where pulverized slag is introduced in the smoke treatment. Pulverizing slag costs much less than shredding it by means of steam or air under pressure, and, aside from this, the greater part of the copper is left in a form which renders it amenable to the simple method of concentration, referred to in the case of matte, where copper is present as a sulphide.

For the purpose of carrying out the processes described, a variety of apparatus may be employed but the principle is in each case the same. It is designed to intimately mix the smeltery smoke with wetted, finely divided material, to cause a spume of water in which the slime of the material is suspended, and bring this water mixture to the best advantage into the path of the sulphurous smoke. The apparatus is devised so that every molecule of SO_2 shall come into contact with a particle of the wetted material, during its travel through the apparatus. All conditions favoring the chemical action are provided for, a time element being especially considered.

Factors Affecting Design of Apparatus

In operations where the smoke is neutralized by slag, the material is continuously fed into the apparatus with water, at the same approximate rate as it is dissolved, in sufficient amounts to care for the whole of the sulphur in the smoke. In designing the apparatus three hours are allowed for any particular charge of slag to dissolve. Some conditions would demand a longer time, but six hours would be about the maximum period required. For a 40-ton slag unit this figure would imply the distribution of 10 tons of slag suspended in the liquor and on the surface of the apparatus. This unit would care for about 16 tons of sulphur or 32 tons of sulphur dioxide per day, which is about 45 lb. SO_2 per minute.

Using a factor deduced from a number of experiments we determined that 2715 lb. of slag per min. must be brought into intimate contact with the smoke for complete absorption in this case; in other words, it is necessary to keep 2715 lb. of undissolved slag constantly on the reaction surfaces of the apparatus to eliminate the 45 lb. of SO_2 passing into the apparatus every minute. The necessary size and rate of motion of the absorber depend on the degree of pulverization of the slag, the temperatures, the degree of concentration of the SO_2 and the form of liquors used.

The important effect the degree of pulverization has on the dimensions of the absorber can be seen in a comparison of the relative surface and weight of 100-mesh and 40-mesh material. A particle of exactly 40 mesh has a little more than six times the surface of a particle of exactly 100 mesh, but its weight is almost 16 times as much as the 100-mesh particle. For any given surface, therefore, 40-mesh material weighs almost 2.7 times that of 100 mesh. From this it is apparent that if we neglect other factors, an apparatus to use 40-mesh material would have to be about 2.7 times as strong as that used for 100 mesh.

Observations have shown that the velocity of chemical action is approximately doubled by an increase in temperature of 18 deg. F. A reaction that would require three hours at 60 deg. F. would be consummated in less than three minutes at 120 deg. F. It can be seen from this representation what a vital influence the temperature will have on the efficiency and general economy of the design. Neglecting subsidiary action, the concentration of the SO_2 in the smoke affects the design in accordance with the laws of partial pressures, in a degree derivable from the formula, $p = \frac{h \times a}{n}$, where h equals the pressure of the gaseous mixture of oxygen, nitrogen and sulphur dioxide, a equals the volume of sulphur dioxide, n, the volume of the mixture, and p the partial pressure of SO_2.

The form of the liquor is a point for consideration in the design. For our purpose we may take the activity of the solution, as a solvent, to be proportional to the molecular concentration of the reacting substances. With the progress of the reaction, the concentration of the salt in solution becomes greater and the rate of solution diminishes. These factors involve the amount of water used in the apparatus.

Efficiency of Liquor as a Solvent Determines Amount of Water Supplied

The quantity of water used in the treatment may be considered fixed, as to its minimum limit, by the saturation point of ferrous sulphate and, as to its maximum, by the best economic adjustment to local conditions. In general, the water supplied the absorber is reduced to the smallest quantity consistent with the practical efficiency of the liquor as a solvent. Usually the concentration of the $FeSO_4$ should not be more than 25 per cent. of its saturation value at the temperature of the absorber action. In our experiments we used ordinarily an amount of water that gave about a 3¼ per cent. solution of $FeSO_4$. Stronger concentrates were easily procurable, but this element was not a factor in the primary tests, and was reserved for consideration in future tests.

The final treatment of the liquor by evaporation on waste ground is inexpensive and efficient. The evaporation is rapid on account of the original heat of the liquid and the thin sheet which is spread over the area. With a depth of three inches, tests on cold water in August, in Utah, showed an average evaporation of over one-fourth of an inch per day. From this determination and from tests on a smaller scale in the laboratory and data derived from other sources an average of one-fifth of an inch per day is taken in the design of the plant.

The tests reported below are representatives of experiments instituted to glean some conception of the rate of solubility of the slag and indirectly the quantity of excess slag necessary in the operation of the process.

Solubility Test No. 1

The object of the test was to determine the relative solubility in SO_2 of slag wool and crushed spherules.

The slag wool was separated from the spherules and the latter crushed to 60 mesh and treated at the same time as the wool with SO_2 liquor of the same strength. The samples were agitated continuously during one hour without the application of heat. Analysis of the slag wool was Fe, 40.55, and of spherules, 41.62 per cent.

The results showed an extraction after five hours of 93 per cent. of the iron in the slag spherules and 94 per cent. in the wool.

Test No. 2

The object of the test was to determine the solubility of ground granulated slag in a 1 per cent. solution of SO_2. The slag was granulated by dropping molten slag into water, then ground to 100 mesh and treated with a 1 per cent. solution of SO_2 and warmed, after which it was agitated. The solution was not strengthened in SO_2 as it was used up. In 2¾ hours, 89.3 per cent. of the iron was dissolved.

The residue was ground and treated for 3¾ hours, resulting in 2 per cent. additional extraction, making a total extraction of 91.3 per cent.

Test on Lead Slag

The object of the test was to determine the amount of residue after treating lead slag with a 1 per cent. solution of SO_2. The experiment was first performed on slag chilled and ground to 100 mesh. The solution was placed over it and slightly warmed without agitation for 2½ hours.

A second test was run on unchilled slag from the dump, ground to 100 mesh and treated as above without agitation.

The analysis of the slag was: SiO_2, 35.3; CaO, 23.4; ZnO, 5.5, and FeO, 35 per cent. After 2½ hours only 3 per cent. remained as residue from the first test and 22 per cent. from the second.

Process More Successful on Blast-furnace Slags Than on Reverberatory Slags

The experiments do not closely reproduce conditions present in the absorber. The reactions are necessarily much slower, for the same conditions of violent agitation and constant application of heat are lacking, but they serve as a starting point for necessary computations in the design of a plant. In general, blast-furnace slag is more easily soluble than reverberatory slag, perhaps because ferric oxide, occurring more frequently in reverberatory slags, forms a slightly less soluble silicate. Free quartz is sometimes a constituent of reverberatory slags; this of course remains inert or in the residue after the smoke treatment, and consequently lowers the degree of concentration.

Tower Experiments

Experiments were performed with a vertical apparatus consisting of two towers 27 and 50 ft. high with shelves or slats introduced to break up the stream of falling slag and the smoke current. In this case gravity is the force producing movement or agitation. The towers were connected directly to a McDougall furnace roasting about 40 tons per day, and the tests, although not the first, are representative of one phase of the smoke process where slag wool is treated. The tests were on a small scale, the apparatus handling between 11 and 22 lb. of SO_2 and 16 to 40 lb. of slag per hour. The experiments succeeding these were on a much larger scale, for then we had to consider the treatment of about 23 pounds of SO_2 a minute or the whole of the SO_2 generated by one 40-ton roaster. The results show a relationship between the absorption and the temperature and volume of the gas. The absorption is also a function of the quality of wool passing through the apparatus and the amount of water.

The large absorber was designed to care for 5000 cu.ft. of gas per min. of 4.5 per cent. SO_2 smoke. This apparatus was in the form of a horizontal rotating cylinder, provided with shelves ranged about its interior circumference. The material was fed by means of a screw conveyer, the water passing in at the same time and place. The exhausted material and charged liquor were drawn out by means of a wooden pump. The smoke entered at one end and was drawn through the apparatus by means of an induction fan. The cylinder was 36 ft. long by 12½ ft. in diameter interior measurement. The outlet of the cylinder was connected with a tower 60 ft. high and 9 ft. square, which from time to time was charged with wool and operated in conjunction with the rotating cylinder.

Efficiency of Process Proved

On trial it was found that the apparatus, while of ample dimensions, did not distribute the material through the smoke to the best advantage and, further than this, it was not strong enough to care for the practcially inert material in the shape of spherules and the excess material which it was found necessary to supply. Only for very brief periods in special cases could we charge the apparatus with more than one-third of the slag necessary to obtain complete absorption. The apparatus was merely a tentative design for the operation of an altogether new process. It well served to demonstrate the efficiency of the process of absorption on a fairly large scale, and to give actual data on which a successful apparatus could be built.

In examining the record of the test it is necessary to bear in mind that the efficiency of the process is measured, not so much by the percentage of the total SO_2 absorbed from the smoke, but by the quantity of SO_2 absorbed by the slag fed to the apparatus. In considering the amount of slag we must eliminate about two-thirds of the total amount put in since it is only the wool, which was seldom more than 33 per cent. of the product, that is easily soluble; the spherules having been slowly acted on. The glaze over each particular spherule and especially the size of the spherules, is explanatory of their slow solution.

Examination of the results indicated that under the conditions, the constant presence of over 100 per cent. excess available slag is demanded for the elimination of 43 per cent. of the sulphur from a 5 per cent. SO_2 smoke. As the gas becomes more and more dilute it is probable, from general considerations, that if the reduction of a 5 per cent. SO_2 gas to a 2.85 per cent. gas requires a 100 per cent. excess of slag, an elimination of the sulphur to about 0.15 per cent., which is well within a safe limit of dilution, a 3200 per cent. excess is required. This corresponds roughly with the figure 5000 per cent. excess deduced from laboratory experiment for excess "slag required" in the design.

My connection with the work terminated before the data derived from the tests could be applied, but the results of the experiments definitely established the facts that the principles of the process are substantial and that they applied quite as well to treatment on a large scale as in the laboratory. In short the work demonstrated that the smeltery-smoke trouble can be eliminated with profit to the smelter.

Extension of a Colliery Working Shaft

Details of Cost and Method Used in Sinking an Old Shaft, Which Was in Constant Use, to a Lower Level without Stopping Mining Operations

BY M. S. HACHITA*

Sinking a shaft or extending an old shaft to a lower level is a common occurrence in the coalfield, but to extend a shaft which is in constant use, without stopping mining operations, as the Alden Coal Company did at Alden, Penn., is quite unusual.

There are two shafts, No. 1 and No. 2, on the property of the Alden Coal Company. The No. 1 shaft, which is bottomed in the Red Ash seam or the lowest workable bed, was sunk early in the history of development. The area tributary to this shaft is practically exhausted and it is now used as a supply shaft.

The No. 2 shaft, which is about three-fourths of a mile from No. 1 shaft, was sunk in 1893 to the Cooper seam, a distance of 616 feet. The beds below the Cooper were developed through tunnels and a rock slope from the Cooper, but the cost of operation constantly increased as the depth of the mine increased. To effect economy in the inside transportation of coal, it was imperative that the No. 2 shaft should be extended to the Red Ash seam, yet the company could not afford to stop operations. In the latter part of 1908, the company adopted the following plan: The shaft to be driven up from the Bennett to the Cooper seam, and sunk from the Bennett to the Red Ash bed.

Fig. 2 shows the plan of the original No. 2 shaft, the dimensions of which are 12 ft. by 34 ft. 8 in. rock clearance; of this total, 15 ft. is for the fan, while two compartments of 7 ft. 1½ in. are for cages, and one compartment of 3 ft. 5 in. is for pipes. This same section is maintained to the Cooper seam, but the 15-ft. air space is omitted from the Cooper to the Red Ash, the extended portion of the shaft. Fig. 1 shows the No. 2 shaft in relation to the gangway roads in several seams. From the Bennett slope at station 5500, a level road was driven to directly under the No. 2 shaft, a distance of 150 ft., for staking out the shaft.

The Preliminary Survey

When making a survey it was found that the guides at the foot of the shaft were not in true position, so that it was necessary to plumb the guides for 100 ft. from the foot, as shown in Fig. 3. An instrument was set up at station *P* and sighted to *A* and *B*, the plumb lines of the guides, and the distances *P A* and *P B* were measured. In the same way, the instrument was set up at the station *P P*, and the observations were taken as before. These observations were traversed and the coördinate values of *A* and *B* were calculated. From these data, the azimuth *A B* was obtained; consequently, the coördinate values of the corners of the shaft *C D E* and *F* were accurately determined. Then a survey was made from the foot of the shaft to the Bennett seam directly under the shaft, a distance of 2280 ft., and then surveyed back to the place of beginning. The survey was traversed and its calculations showed that it closed within one-hundredth of a foot. Owing to the importance of great accuracy required in this work, two similar surveys were made and the results of these were identical with the first one. In the meantime, the place was squared up and made ready to drive the shaft up from the Bennett seam, a distance of 114 feet.

Details of Methods Used in Raising

Fig. 4 shows the plan of the shaft as laid out in the Bennett seam. From the nearest station, corners of the shaft were staked out, and at each of these corners a hole about 1 in. in diameter and 3 ft. long was drilled, as shown by *a, b, c* and *d*. Pitch of these holes was about 6 deg. dipping in. These holes were carefully cleaned and measured, and into them iron rods 4 ft. long were inserted, and the corners of the shaft were marked on these rods. Each hole had its own rod, and these rods were placed in the holes only when the shaft was plumbed.

The shaft was plumbed at every cut; the four corners of the shaft were used for a manway and for ventilation. This was effected by means of timbering, as shown by *e, f, g* and *h*, Fig. 4. The length of these timbers was from 8 to 10 ft. and they were 10 in. in diameter. The loose rock was placed within the timbers. The space between two sticks varied from 2½ to 5 ft. center to center, much depending upon the size of the rock. Dogs were driven in the middle of each timber which enabled the workmen to climb up

FIG. 1. SHOWING NO. 2 SHAFT IN RELATION TO GANGWAY ROADS

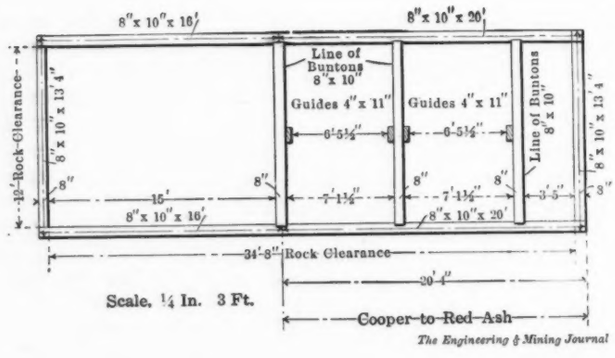

FIG. 2. PLAN OF ORIGINAL NO. 2 SHAFT

*Mining engineer, with Lehigh Valley Coal Company, Wilkes-Barre, Penn.

the shaft. These dogs were placed in the under side of the sticks so that the falling rocks would not interfere.

Shaft Raised 96 Feet in Four Months

Fig. 5 shows the side elevation of the shaft between the Cooper and Bennett seams. The shaft was driven up within 18 ft. of the bottom in the Cooper bed. At this point the upraising was stopped and the face was securely timbered with sticks 12 in. in diameter, as shown in Fig. 5. Then the face of the shaft and the Cooper seam were connected by a hole 2 ft. in diameter, for the rope. The loose rock was thrown down the manway to the Bennett seam and then loaded into cars. Part of this rock was disposed of in the old workings and part hoisted up. This part of the shaft was timbered as the loose rock was removed. The work commenced Feb. 1, 1909. The shaft was raised 96 ft., timbered and cleared of all loose rock in four months. The men worked three shifts a day, with six men per shift.

Fig. 6 shows the plan of the shaft at the Bennett level. From this seam, the shaft was sunk as usual to the Red Ash bed; the corners of the shaft were determined by the iron rods shown in Fig. 4. The lines for sinking were placed at the corners of the first timber at this level. This was affected by small triangular pieces of wood nailed at each corner, as shown in Fig. 6. A ½-in. hole was drilled in each of these blocks 2 in. from each side; through these holes copper wires were hung and a 12-lb. plumb-bob, made of car axle, was attached to the end of each wire; the other ends of the wires were fastened to reels on the timber. By this means the lines were conveniently handled. When firing, the plumb-bobs were raised sufficiently high to prevent their injury by flying rock.

Fig. 7 shows the section of the shaft as sunk from the Bennett seam. The rock was hoisted to the Bennett level by the old slope engines located outside. The rope was brought down in the pipe compartment of the shaft, thence through the 2-ft. holes, as shown in the sketch. Two sheave wheels, 6 ft. in diameter, were placed between the Cooper and the Bennett seams to center the rope. A platform was built at the Bennett level to handle the rock bucket. The bucket was hoisted a little above the platform; it was then hooked to a chain which was fastened on the side of the shaft. When the rope was slacked, the bucket was brought directly over the car and dumped into it. The sketch shows a dumping position of the bucket. When the sinking was completed, the 18-ft. barrier rock at the old foot in the Cooper seam was removed from the top. The two shafts were thus connected. They met exactly in the line as they were originally planned, the error of closure being practically negligible.

Timber Used

The timber used was 8x10-in. yellow pine. There are in all 248 sets of timber set in the new part of the shaft. Clanny and Wolf lamps were used in

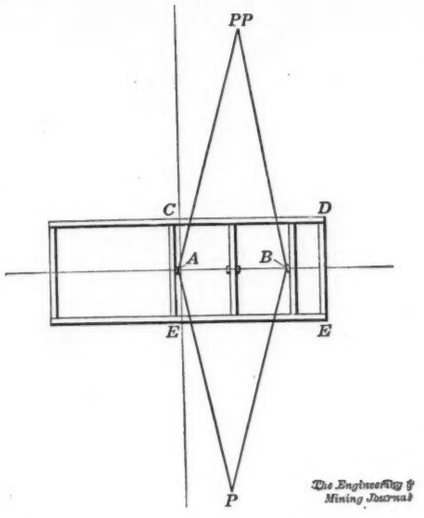

Fig. 3. Plan of Survey at Foot of Shaft in Cooper Seam

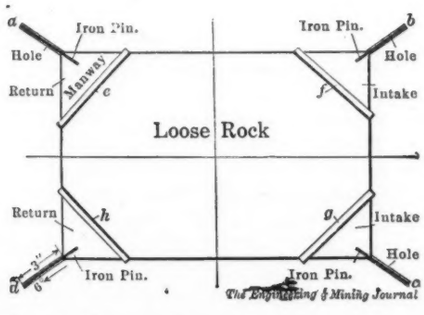

Fig. 4. Plan of Shaft in Bennett Seam as It Was Raised to Cooper Bed

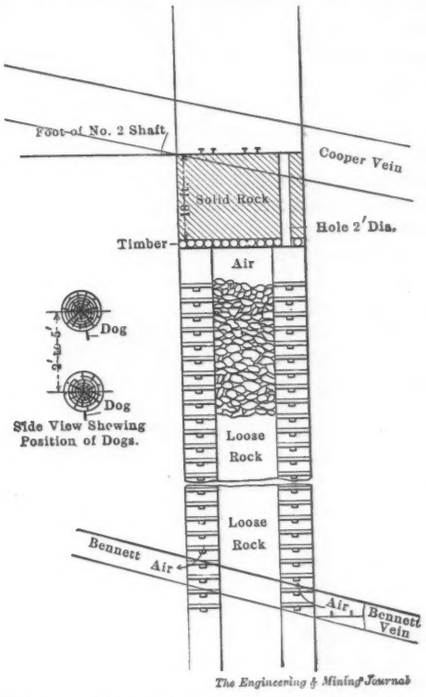

Fig. 5. Side Elevation of Shaft from Bennett to Cooper Seam

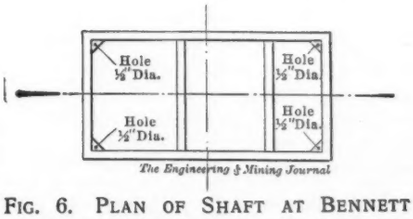

Fig. 6. Plan of Shaft at Bennett Seam as It Was Sunk to Red Ash Bed

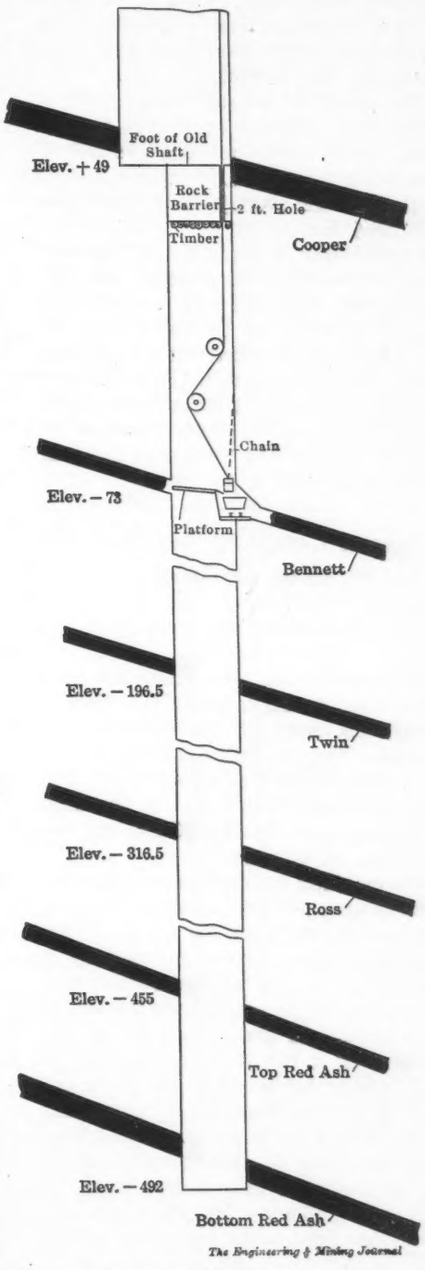

Fig. 7. Showing Section of Shaft as Sunk from the Bennett Seam

this work, as the mine generated considerable gas. The work was therefore somewhat retarded by the use of safety lamps.

The contract price per yard for raising and sinking the shaft was $98. The contact price per set of timber was $13. The total amount paid contractor on account of yardage was $17,339.33. The total amount paid contractor on account of 248 sets of timber was $3224. Miscellaneous amounts paid contractor totaled $2739.31, making a grand total expenditure of $23,302.64. The total cost per yard, therefore, was $129.22.

The shaft work was started Feb. 1, 1909, and completed September 1, 1910. Total depth of the new shaft is 541 ft. The grand total depth of the No. 2 shaft is 1157 ft. The average monthly progress was 28½ feet.

Credit must be given to the engineer, William Norton, who planned and designed the shaft and who had only two breaker boys for his help when he made the surveys and staked out for the new shaft. To the contractor, Francis Poole, and John Turner, the inside superintendent of mines, under whose guidance the shaft was completed without an accident, much credit also is due.

Evidence Concering the Starkville Mine Explosion

SPECIAL CORRESPONDENCE

Much interesting information has been brought out by the coroner's jury investigating the cause of the Starkville explosion. The Starkville mine is one of the properties belonging to the Colorado Fuel and Iron Company; the operation is situated near Trinidad, Colo., and the explosion occurred Oct. 8.

The evidence submitted shows that the mine was not properly sprinkled and that the dust lay between the tracks in the main haulageway, several inches deep. It was brought out in the investigation that a short circuit, or spark, from the trolley wire ignited the dust raised by the derailment of a trip of cars entering the mine, and probably caused the explosion. Superintendent Thompson declared that in his opinion the first 11 men had been instantly killed by the explosion, while the remaining 45 miners died from the effect of afterdamp. Mr. Thompson also stated that prior to the explosion, he had thought the mine sufficiently sprinkled, but since the accident he had changed his opinion.

The most damaging testimony against the company was submitted by a motorman and a trip-rider.

The motor-driver declared that between the entries C—1 and K—1 it was not necessary to sprinkle the mine because there was plenty of natural moisture. He stated, however, that the rest of the mine was dusty, and that at times, the dust was so dense in the mine that on his trip out he could not see the light on the cap of the trip-rider a few car lengths behind him; also that the water tanks used for sprinkling held 300 and 700 gal. respectively, but that only one-third of this water was used for sprinkling. The testimony of the trip-rider corroborated that given by the motorman in practically all details, with the additional fact that no particular orders were issued for sprinkling, but that the men used their own judgment in the matter.

French View of American Railway Haulage*

The great weight of the American trains is one of the peculiarities of their practice, especially when they have an important traffic of coal or ores. Upon the railroads in Virginia, where the grades are easy and where they have powerful locomotives for the hauling, a train weighing 8160 tons has been drawn by a Mallet locomotive; this train was composed of 120 steel cars, each of which carried 50 tons and which, when loaded, weighed 68 tons. The engine weighed 145 tons and the tender 70 tons, which makes the gross weight of the entire train 8375 tons.

The ordinary coal train upon this railroad consists of 80 cars, which carry 4000 tons and which weigh complete 5520 tons; to this weight must be added 16 tons for the caboose, 122 tons for the locomotive and 72 tons for the tender, giving a gross weight of 7620 tons. The locomotives of these trains weigh 145 tons, of which 110 tons rests upon the driving wheels. The diameter of these is 1.45 m. The cylinders are 0.61 m. in diameter, and have 0.762 m. stroke. The fire box has 4.74 sq.m. of grate surface and 4.21 sq.m. of fire (or heating) surface. Frequently these weights are exceeded and go upward of 7000 tons. The speed of these trains toward the port of shipping, distance about 200 km., averages 24 km. per hour, including stops.

On the Pennsylvania Railroad a train of 105 cars (steel) has been drawn bearing 5000 tons of coal, which, with the engine and cars, weighed complete 6900 tons. This train ran 205 km. in 7 hours. Upon this same road they often run trains of a gross weight of 4350 to 5800 tons. Upon the Lake Shore & Michigan Southern Railroad, the record train consisted of 100 steel cars, which were loaded with iron ore and weighed complete 6700 tons; this train ran 108 km. with an average speed of 20 km. per hour. In certain cases the employment of these enormous trains follows a congestion of traffic in certain districts, but it is only fair to say that the usual coal train on the Virginian Railway has a gross weight of at least 5800 tons, of which about 4000 tons is generally coal.

*Translation from the *Proceedings* of the French Institute of Civil Engineers.

Must Extract All the Coal or Pay Damages

SPECIAL CORRESPONDENCE

An important suit involving an unsettled question has just been settled by the Putnam circuit court at Greene Castle, Indiana.

The suit grew out of the abandonment of a mine, and the term over which the suit was contested was "minable coal." No previous suit has ever defined what the term "minable coal" meant, and as a consequence the suit was unique.

The Vandalia Coal Company purchased a mine from W. W. Ray, paying $45,000 for the mine and leases. The lease provided that all "minable soal" must be mined and that the minimum royalty per annum would be $600 on the 40-acre tract. There was a seam of good block coal ranging from 2½ ft. to 3½ ft., and the company only mined 10 acres when it abandoned the mine. The plaintiff asserted that it is now impossible to mine the balance of the coal and that the lease was violated.

The case was in court several years, and the judgment favors the plaintiff for the amount of the royalty due the owner from 1907 to 1919, at the rate of $600 a year. This decision will doubtless serve as a precedent in such cases. A coal-mining company in Indiana must pay royalty and damages when it fails to extract all the coal from leased land.

Mine Explosion in Kentucky

A serious explosion occurred in the No. 3 mine of the Providence Mining Company, operating near Providence, Ky., on Nov. 25. The mine is a new one, the shaft being 100 ft. in depth, and the underground development work consisting of only a few short entries. As a result of the disaster, 11 coal miners were entombed in the mine. A rescue train from the Mine Rescue Station at Linton, Ind., hurried to the mine immediately after the accident, and rescue work was started at once.

Coal areas covering about 90 square miles underlying Ground-Hog mountain on the Upper Skeena, British Columbia, have been staked for the Crows Nest Pass Coal Company, the National Finance Company, of Vancouver, and a Winnipeg syndicate. This area is said to be better than the Crows Nest Pass district. A charter is being applied for from the British Columbia government for the construction of a railway from Hazelton into the new coalfield.

Repair Work in Colliery Practice

A Little Common Sense and a Knowledge of Portable Tools Will Frequently Save a Colliery from a Serious Shutdown and Loss of Output

BY JAMES A. SEAGER*

The duties of the engineer in charge of the mechanical equipment of a colliery are varied and interesting, and in many cases he is called upon to execute repairs on the spot with the best means at his command in order to save time and labor, as well as the cost of transport, which would be necessary if a broken or faulty part had to be taken out of the pit and transported to the nearest workshop, where an adequate equipment or tools was to be found. Large groups of collieries have, of course, their own work shops, situated in a convenient position to deal with repair work from the various pits, but in the case of the smaller collieries, especially when these are situated long distances from any manufacturing town, the engineer is frequently called upon to exercise his ingenuity and to get over trouble by means and methods that would hardly appeal to a man who was surrounded with uptodate equipment in modern engineering works. It is from the point of view of showing the amount of self-reliance which a colliery engineer must have, even in his ordinary and routine work, and not with any idea that the best methods of overcoming the troubles are indicated, that the following notes are written.

Rough and Ready Repairs

A large amount of the repair work in colliery practice may be classed under the term of rough and ready millwrighting, and this is the phase of the subject which it is proposed to deal with in this article. For example, breakdowns in the gear wheels of haulage systems, pumps, etc., in colliery work are fairly frequent and a case in point was that of a large gear wheel in the main haulage of one colliery which, owing to a sudden check, broke away two of its teeth at different places on its circumference. As it was urgently necessary to get this main haulage going again as quickly as possible, inasmuch as the pit working was dislocated while the haulage was out of action, the engineer in charge of the work at once gave orders to the forge to take two steel blanks and forge them up to the approximate shape of one of the teeth, leaving an extension at one end to provide a root in the rim of the wheel. These teeth after forging were then chipped and filed up to the exact shape of one of the sound teeth and the extension at the root was made into a dovetail. The rim of the wheel was then chipped out carefully in order to fit the dovetail exactly and the forged-steel teeth were then driven into place.

In order to make sure that the vibration and continuous working did not cause the teeth either to edge out sideways or to cant over and break away the rim of the wheel, two holes were drilled right through the teeth and the rim of the wheel, as shown in the accompanying sketch. These holes were countersunk at the top, that is to say, at the tip of the teeth, and bolts with countersunk heads were fitted to the holes and drawn up tight by means of nuts on the inside of the rim. This repair answered satisfactorily and became a permanent job, although it was at first only intended as a temporary repair until a new gear wheel could be obtained. The expense of this, however, induced the engineer to let the gear wheel run permanently as it seemed to answer satisfactorily. The only precaution that was taken in subsequent running was to be careful at any time when the engine was put into gear with a heavy load on it.

Breakdown Caused by Reversing Haulage Engine

A somewhat similar breakdown to the above, occurring on a lighter haulage which was periodically reversed, may be mentioned in order to show an alternative method of getting over this trouble, and also to illustrate a rough and ready device for automatically checking too violent usage of such gear. The breakdown occurred owing to reversing the haulage engine with full steam on, and the result of this sudden change of load was that several teeth were broken out of the rim of the gear wheel. The power transmitted in this case was not so heavy as the one previously mentioned, and therefore it was judged to be sufficiently satisfactory to chip and file the broken teeth down till they were flush with the rim. Then a series of holes were drilled and tapped into the rim along the edge of the former tooth in each case. Steel studs were then prepared and screwed at one end so that they made a very tight fit into the tapped holes and were then screwed into place by means of putting a square head on each stud to fit a spanner, this square head being subsequently cut away. When these studs had been screwed very tightly into place, as shown in Fig. 2, they were filed up to the shape of the other teeth on the gear wheel with a heavy file and with some care; it was found that the teeth thus formed were sufficiently strong to take up their duty.

In order, however, to prevent a sudden and heavy strain being put upon the gear, inasmuch as it was altogether unnecessary to reverse the engine at full power, a brass plate was cut and a hole about the area of the valve was drilled in its center. This plate was then placed between the flange of the steam pipe leading to the engine and the flange to the stop valve on the engine, and the result was that whenever any extra-heavy demand was made on the engine as when the man in charge tried to reverse with full steam, the head of steam was throttled and the engine worked on considerably under its normal full power. The throttling, of course, ceased as soon as the engine was running steadily in either direction so that there was no loss of speed on the haulage except on the beginning and end of the haul. This precaution was found to work satisfactorily in practice and prevented the damage which might have been frequently caused through the handling of the engine by a man who did not know much about it, and whose main idea was to get the haulage working with as small amount of trouble to himself as he could manage.

Another Method of Supplying Teeth to a Cogwheel

While upon the subject of millwrighting work of this description, a further example of the way in which trouble due to broken teeth was overcome may be of interest. In this case the cogwheel was of similar diameter and transmitted heavy power. The whole wheel was of a solid description as will be seen by the sketch Fig. 3, and a sound repair was required in order to enable it to work properly. The way in which this was effected was to trim the broken teeth down flush with the root and then to cut a square radial channel at each side of the rim as shown, making the channel the same breadth throughout as the width of the teeth at its root. A piece of wrought iron was then obtained and slotted so as to slide over the web of the wheel and leaving two projections to fit down into the square channels cut in the rim. This was driven down into the place on the rim and the projecting portion formed a blank which was chipped and filed to the shape of the teeth on the cogwheel.

The next step was to make sure that this improvised tooth would not fly out or shift in action and by means of a portable

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drill a hole was put through the projecting tongues of the new tooth and the rim of the wheel with which they meshed as shown. This hole was then countersunk at either side and a piece of round iron obtained of the same size as the hole. This iron was then heated white hot, driven quickly into the hole, and before cool hammered over at each end so as to form a rivet. Its subsequent contraction on cooling drew the whole of the repair together so firmly that no amount of heavy stress to which the cogwheel was subsequently subjected was able to displace the tooth in the slightest degree.

Repairing a Belt Pulley

Air compressors and pumps form part of the colliery equipment which require careful inspection and maintenance, and here again it occasionally happens that a certain amount of ingenuity has to be displayed in getting a speedy and safe repair. An instance of this occurred in connection with a belt pulley which was employed in connection with a ram pumping plant, driven from an electric motor. For some reason or other, probably due to too sudden a start on a heavy head, two arms of the belt pulley broke away close to the rim. This was an awkward occurrence inasmuch as the pump was employed in unwatering the mine and it was essential that it should be got away again before the water had made any considerable headway. Under the circumstances there was no time to spare in ordering a new pulley and getting it into place so that the best repair possible had to be made.

In order to do this the arrangement shown in the sketch, Fig. 3, was adopted. Half-inch holes were drilled through the arms that were broken and four pieces of iron plate were heated in the forge and bent as closely as possible to the shape of the arms. At one end they lapped over so as to form flanges for attachment to the rim. They were then placed in position as shown and holes drilled through them to correspond with the holes in the arms, and a bolt passed through to hold the plate in position during the operation of drilling holes in the side flanges for bolts which drew the two plates together in each case. When a muff had thus been formed round the actual crack, the flanges at right angles which were in contact with the rim of the wheel were then attended to. Holes were drilled in the flanges of the plate passing through the rim of the wheel and the rim was tapped to receive studs which were passed through the flanges on the other side and screwed tightly into place. This completed a solid repair, and it will be seen that the bolts on each side of the arm together with the substance of the iron plates took up the drive without imposing much strain on the actual material of the broken arms of the pulley.

Repair to Bed Plate of Compressor Engine

As a final example of a long range of accidents and repair work which a colliery engineer has to undertake may be mentioned a repair which was made to the bed plate of an air-compressor engine which was broken. The reason of this fracture was that the holding-down bolts of the bed plate were slacked and sufficient care had not been taken in the original installation of the plant to insure that a permanently satisfactory foundation had been prepared. This by the way is a frequent cause of trouble in collieries. It is far too often the case that either no foundation at all is prepared except the ordinary floor, in which case the frame work of the plant has itself to take up the strain due to unequal pressure, or when this has been thought of to some extent a couple of balks of timber are laid down and the plant placed upon this. This latter provision answers for a time, but the constant working of the plant has a tendency to cause the balks to move, and in a damp mine it will be found that such balks first swell, throwing the plant out of line, and ultimately rot, in which latter case the last condition of the plant is even worse than if it had been laid directly on the floor. It will repay the trouble if a properly formed concrete block is put down for such plant but this is a provision which is rarely made with any collieries.

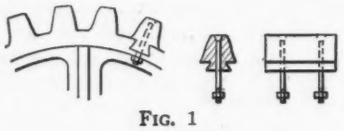

Fig. 1

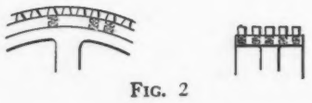

Fig. 2

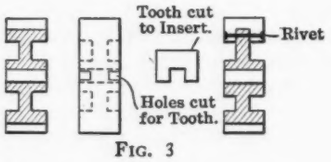

Fig. 3

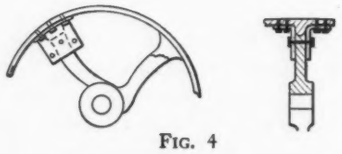

Fig. 4

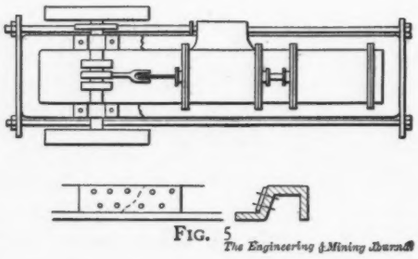

Fig. 5

The Engineering & Mining Journal

Showing Simple Methods of Making Miscellaneous Repairs

In this particular instance the result of insufficient protection was that the bed plate between the steam cylinder and the crank bearings was cracked completely through, which put the plant entirely out of action. The bedplate was of a rectangular description as shown roughly in the sketch, and at the point of fracture it was decided to place heavy patches of thick steel plate (boiler plate) with stud bolts screwed in tight at frequent intervals as shown in the sketch. This in itself was insufficient, even with careful packing of the frame from the floor in order to distribute the weight evenly, inasmuch as there was considerable strain backward and forward at each reversal of stroke; in order to overcome this fault, two long stays of round bar iron were secured some 8 in. longer than the total length of the compressor frame. These were screwed at both ends and nuts fitted. Two heavy plates exceeding the width of the bed plate were then obtained and holes drilled in them so that the threaded stays which were passed through them, lay close against the side of the bed plate. In this position the nuts were tightened up and the heavy plates in this way drew the ends of the frame together and took up any reciprocating strain. This repair proved entirely satisfactory and the engine is still running without displacement and doing its full amount of work.

The above examples of repair work do not by any means include the whole range of trouble which may be anticipated in colliery practice, but they are sufficient to indicate that the engineer has constantly to keep his wits about him in order to safeguard the interests of his employers. Frequently the work is of a heavy and rough description, but it is none the less valuable on that account, and an ounce of common sense and a knowledge of portable tools has frequently saved the colliery from a breakdown, which quite apart from the cost of repair, would have meant hundreds of dollars damage in loss of time of the pit men and diminution of output. For this reason it is hoped that these practical notes may be of interest.

The consumption of nitrate of soda in the world for the first eight months of 1910 amounted to 2,125,232 tons, against 1,718,270 tons for 1909. This breaks the record, according to consular reports. The increase in August amounted to 13 per cent. over the same month for last year.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

R. H. Toll, of Denver, is at San Diego, Cal., where he will remain until near the holidays.

R. Van Cutsem, of London, is inspecting the Porcupine camp with a view to investing.

J. B. Tyrrell, mining engineer, of Toronto, has opened a branch office in Porcupine, Ontario.

E. E. Kirby expects to visit New York about the end of December. At present he is in California.

Charles K. Davis, of Baltimore, has gone to Chile as general foreman for the Braden Copper Company.

Frederick G. Clapp, of Pittsburg, has gone back to continue examinations in the northern Ohio gasfields.

Lester W. Strauss is making professional investigations in the interior of Peru. His address is Lima, Peru.

George W. Maynard, consulting mining engineer, has gone to Benton, Mono county, Cal., on professional business.

W. H. Aldridge, general manager of the Consolidated Mining and Smelting Company of Canada, is visiting New York.

R. M. Aitken, of Kitcat & Aitken, London, has been elected a director of Amalgamated Asbestos, as representative of British interests.

C. O. Moss has resigned his position as superintendent of the Sierra Morena Mining and Refining Corporation, near Paso Robles, California.

William B. Anthony has resigned his position with the Equidad Mining Company and has opened an assay office and laboratory at Guanajuato, Mexico.

Thomas Moses, mine inspector of the fifth district of Illinois, has resigned and has been appointed superintendent of the Bunsen Coal Company's mines, at Westville.

J. F. Callbreath, secretary of the American Mining Congress, has been in Salt Lake recently, conferring with President John Dern in regard to organizing local branches.

Horace V. Winchell presented a report on the International Geological Congress in Stockholm last August, on Dec. 6, at the meeting of the Minnesota Academy of Sciences, at Minneapolis.

Charles H. Thompson, for six years past general manager of the Wind Rock Coal Company, Windrock, Tenn., resigned Oct. 15, to become president of the Myers-Whaley Company, Knoxville, Tenn., manufacturer of coal-loading machinery.

Gustav Setz, the veteran metallurgist and the Nestor of southeast Missouri smelting, has retired to take a well earned rest, after a long and most successful career. His son Carl succeeds him as superintendent of the St. Joseph plant.

R. E. Eggebrecht, who has been for some years in charge of the coal traffic of the Missouri Pacific railway, has resigned from that position and has bought an interest in the Standard Collieries Company, operating two large mines in the Carterville district. He has been elected vice-president of the company.

OBITUARY

Henry Debardaleben died at Birmingham, Ala., Dec. 6, aged 71 years. He was one of the pioneers and organizers of the Alabama iron industry.

E. G. Walten, superintendent of the Enterprise coal mines, at Enterprise, Iowa, died Nov. 26, from injuries received in a fall in the mine a few days before.

E. W. Lawton, an American mining man formerly at Guadalupe y Calvo, but for some time past at Parral, Mexico, was shot and killed Nov. 21, in the revolutionary riots at Parral.

Edward A. Smith died suddenly in Pittsburg, Dec. 2. He was 53 years old. He was born and educated in Pittsburg and for a number of years was active in the management of the Crucible Steel Company and of La Belle Steel Company, of Wheeling.

Robert Angus died at Toronto, Ont., Nov. 19, aged 57 years. He was born in Scotland, but came to this country when a young man, and engaged in mining in the Northwest. He helped to sink the first shaft in Butte, and was at several mines near Helena; he was at one time superintendent of the Iron Mountain mine in Montana. Later he was in the Republic district in Washington and was superintendent of Le Roi mine, at Rossland, B. C. Recently he had been superintendent of the Alice mine, at Butte, but retired two months ago, on account of his health.

Thomas McQuade, a well known coal man, died at Linton, Ind., Nov. 29, aged 52 years. He was a mine inspector connected with the State bureau of mines and did excellent service for a number of years; subsequently taking service with the Vandalia Coal Mining Company as superintendent of the Linton district. He was regarded as a faithful and competent man. He was forced to deal with a number of foreign miners in the mines in the Linton field, but was fearless and after meeting a number of critical situations, won the friendship and respect of all those miners.

Thomas Bellis died at Altoona, Penn., Nov. 20, aged 59 years. He was born in Wales and brought up as a coal miner. He came to the United States in 1880, and first settled at Philipsburg, Clearfield county, Penn., where he was engaged in mining with Thomas Barnes and other pioneers in the coal industry of that section, and later went to Burnside, where with James Passmore he organized and operated the Bellmore Coal Company. Later he assisted in the organization and acted as a director of the Urey Ridge Coal Company, of Indiana county, and also became a director of the Glenwood Coal Company, of Glen Campbell. More recently he moved to Altoona, where he assisted in the organization of the Forge Coal Company, with operations at Portage. He was also a director in the Springfield Coal Company, at Nant-y-Glo. He was the first practical coal man in the Indiana field and he superintended the opening of the first mine at Hastings.

SOCIETIES and TECHNICAL SCHOOLS

Mining and Metallurgical Society—The following have been elected to membership: F. W. Parsons, H. C. Wilmot and Louis A. Wright.

Canadian Mining Institute—The Toronto Branch entertained the members of the Institute Council at dinner, Dec. 2, Prof. H. E. T. Haultain, of Toronto University, presiding. Hon. Frank Cochrane, Ontario Minister of Mines, asked for the support and coöperation of the Institute in suppressing wildcat schemes, and in suggesting changes in the mining laws.

Coal Mining Institute of America—The program for the winter meeting at Pittsburg states that the headquarters will be at the Fort Pitt hotel; meetings will be at the Carnegie Institute. On the first day, Dec. 15, there will be three sessions. In the morning the presidential address will be made by H. H. Stoek, reports of committees will be received and other business transacted; and there will be a discussion on "A Standard Shaft Bottom with Especial Reference to Safety and Economy in a Gaseous Mine," led by W. E. Fohl, of Pittsburg. At the afternoon session there will be papers on "Mine Fires," by A. G. Morse, and on "Recent Developments in Anthracite Mining Practice," by Charles Enzian; with a discussion, led by F. W. Cunningham, on "The Best Method of Removing Coal Pillars." In the evening the Institute dinner will be held, at which addresses will be made on "The Federal Bureau of Mines," by Dr. J. A. Holmes, and on "The Red Cross in Mining Work," by Maj. Charles Lynch. On the second day, Dec. 16, papers will be read on "Recent Developments in the Use of Steel Mining Supports," by R. B. Woodworth; and on "Equalization of Fuels," by H. K. Myers. The session will be closed by the discussion of questions which may be submitted. In the afternoon members will visit the Westinghouse electric works.

EDITORIAL CORRESPONDENCE

Reports From Our Own Representatives on Important Events From Many Important Mining Centers of the World

San Francisco

Dec. 3—A syndicate of Hague, Holland, capitalists, represented by Herman Mattern, of Ashland, Ore., has made final payment on the Highland mine near Etna, Siskiyou county, the reported price being $200,000. The former owners are two firms of lawyers who successfully conducted a lawsuit against the property some time since, and J. M. Tethrow, of Etna, the latter owning one-half. The Hague people have also bought the Diamond gold mine for $25,000 and a dozen smaller claims in the same vicinity as the Highland, which is in the mineral zone fifteen miles west of Etna. The sale of these mines is of great importance to the section referred to as development and equipment of the properties will be at once undertaken.

In the same county, near Yreka, a Bakersfield company has bonded for $50,000 the Greenhorn creek and tributary ground from the county road to the Yreka dam. This ground is to be very thoroughly prospected. Claude E. Gillis represented the owners.

An extensive purchase of mines in Shasta county has been made by E. Bechtold and Dr. Greuzel, of Dresden, Germany, through George Bayha, of Redding. About two years ago Bayha concluded a deal with Frank Panter, owner of the Evening Star mine in Old Diggings district six miles from Redding, who had been working the property for 20 years, until it was quite fully developed. Through the fluxing quality of the Evening Star ores a ready sale was made of them to the smelteries at Keswick, Kennett and Coram and about $400,000 has been taken out. Since Mr. Bayha took charge a year ago $30,000 has been expended in exploration and development in the Evening Star. It was supposed for some time that the mine was in the hands of German capital and this is confirmed by the recent visit of Messrs. Bechtold and Greuzel and conclusion of the purchase.

The sale of both the Siskiyou and Shasta county mines to foreigners shows that California mines are receiving renewed attention abroad. American capitalists have been going to newer and more noted fields and have rather neglected California gold mines. In fact while it is comparatively easy to engage the attention of capital in the oilfields of the State, it is difficult to get California capital to invest in the gold mines. This makes many California gold and silver mines available to foreign capital.

Denver

Dec. 5—Computation by a competent engineer shows that it would cost 6½ times more to drain the Cripple Creek district to the present depth of the deep-drainage tunnel by pumping than by the tunnel. This will convey an idea of the benefits to be derived from this great work, which has just been completed through the dry, hard granite "rim," or surrounding country rock, into the more porous and spongy volcanic breccia area, which contains the gold-bearing veins, and also the vast amount of water which it is desired to liberate, and which is expected to unwater the mines an average of 730 ft. below their present lowest workings. One big mine, the El Paso, has already been unwatered, and it is stated today that in all mines on Beacon hill, the Mary McKinney and Elkton especially, the water has lowered 5 ft. or more, though the mines at the extreme east of the camp have not yet shown any lowering. The drainage will, of course, be slow, as may be gathered from the fact that in September, 1904, according to careful records kept by the engineer of the Cripple Creek drainage tunnel (the next one above the Roosevelt, or deep drainage), the amount of water drained to lower one vertical foot in the principal shafts in the district was 58,109,000 gal., and that the removal of 4115 gal. per min. only lowered the water level in the central and western groups of mines at the rate of 4 ft. per month.

As no new phenomenally rich camps are being found in Colorado, owing chiefly, it is believed, to the obstacles thrown in the way of prospectors mainly by the Forest Service of the United States, the thoughts and energies of the mining men of the State have turned with already surprising results to making new mines out of the old ones. As it has been abundantly proved that those which would not pay formerly will now, unwatering old mines and districts with an early rich record has become quite a "vogue" all over the State, and is being mainly accomplished by driving long tunnels. The Cripple Creek deep-drainage and Newhouse tunnels are the biggest enterprises in this line, and their success has encouraged all the smaller ones. Some districts, of course, are not so situated as to be available for tunnel operations, and must, therefore, be pumped. Among these is the once phenomenally rich silver-producing camp of Aspen. From this now comes a most remarkable and interesting story. The mammoth station pump in the Free Silver mine has been 90 ft. under water, and disabled, for some time, practically stopping deep mining at Aspen. The Free Silver and Mollie Gibson mines are under lease to the Smuggler company. It is said that some joker asked the manager, H. A. Wilcox, why he did not get a deep-sea diver to go down and fix the pump. This he actually did, and got the American-Chapman Wrecking Company, of New York, to send out two divers, with apparatus. They found that the pressure at 90 ft. was too great to work, so two sinking pumps and the relief pump were started at the 1100-ft. level, and the water was lowered to 65 ft., when Fred Johnson, the diver, went down, and in a week's work repaired the station pump. Steam was turned on, and it is stated that the pump is now throwing 1200 gal. per min. As soon as the shaft is cleared, big electric power pump will be installed, and the result, it seems, will be the rejuvenation of Aspen.

The tonnage of the Cripple Creek district in November is given at 75,180 tons, of a gross bullion value of $1,381,050. This is $45,000 increase over October. Stratton's Independence, Ltd., has increased its output 1500 tons this month.

The application of the Northern Coal and Coke Company for an injunction against the strikers, restraining them from acts of violence, has been heard by the district court, and after listening to testimony for two days, the judge ordered that a temporary injunction be issued, the permanent injunction being left to ultimate determination. The final hearing will come on probably within a month. The writ is directed against the United Mine Workers of America, district No. 15; Marshall Local Union No. 483; Superior Local Union No. 84; Louisville Local Union No. 1668; Lafayette Local Union No. 1388, and to the members of these unions, and the officers of the United Mine Workers in Denver.

Butte

Dec. 4—Much improvement work among the railroads of the State is looked forward to for the coming spring. The Northern Pacific intends to complete its Glendive-Helena cutoff, for which the surveys were made some time since. This will decrease the distance from St. Paul over that road some 85 miles and will tap a section of the State now without railroad facilities. The Great Northern will

begin work on a cutoff from Mandan via. Lewistown to a point on the Billings & Northern road which will shorten the distance on that road to the coast nearly 100 miles. It is also quite possible that the Big Blackfoot Railway Company will complete its road up the Blackfoot since considerable grading has already been done.

A bill providing for compulsory compensation to injured employees of corporations is now being drafted by a committee appointed for that purpose by the governor, and will be presented at the session of the legislature which meets in January. The committee is presided over by Justice Holloway of the supreme court.

A joint committee of six, representing the coal mines and operators of the State, has been appointed to draft legislation for the supervision of the coal-mining industry. Among the measures which will be considered are sanitation and ventilation, safety appliances and the proper safeguarding of the lives of the miners and the property of the operators.

Salt Lake City

Dec. 5—Much leasing is being done at the Daly West and Daly-Judge mines, in Park City. The output of the former is showing a marked increase, since the upper workings have been turned over to leasers. Many of the leasers are doing well, and on account of the increase in individual lots of ore sent out, the force at the Park City sampler has been added to.

A somewhat different system has been adopted by the Daly-Judge. Instead of turning over a block of ground for a certain period, to be worked on a fixed or sliding royalty, the company gives leases on ground which it wishes developed, and guarantees the leasers regular miners' wages for their work. If ore of enough importance is developed at any time, the management reserves the right to cancel the lease and continue work on company account. The miners do not stand to lose anything by this system, and are allowed to make up to double the regular miners' wages, but no more. Frequently a stringer, or small streak of ore, which is too small to be worked profitably by the company, can be worked independently by a leaser at a fair profit. Recently a body of good ore was opened by leasers, on the Middle vein below the 1400, which has been taken over on company account. The system has proved satisfactory to the company. The men take an interest in the work, and there are always applications pending.

The suit brought by Joseph E. Caine and Max Junghandel against F. J. Hagenbarth to recover $190,000, alleged to be due as the balance of an option held on the Ludwig mine at Yerrington, was recently dismissed from the third district court. A new action has been begun in the Federal court of Idaho, the action being brought there, as the defendant is now a resident of that State. The suit arose from an option which Mr. Caine and Mr. Junghandel obtained on the mine in 1907 and sold to Mr. Hagenbarth for $200,000. The latter paid $10,000 in cash and then transferred the option to the Nevada-Douglas Mining Company. The Nevada-Douglas Company, instead of closing the transaction, waited until the Caine and Junghandel option expired and then bought the property. Mr. Hagenbarth refused to pay the remaining $190,000. A judgment for this amount with interest from 1907 was obtained against him in the district court. An appeal was made to the Supreme Court, which ordered another trial for Nov. 14. The case was dismissed without prejudice a few days before it was called, and was recently filed in the Federal court of Idaho. The hearing has been set for January.

Cobalt

Dec. 6—Gowganda has been showing up well during the last few months, and it is certain that the shipments this winter wil be in excess of last year. The Reeves-Dobie will have the concentrator running soon and will be able to make regular shipments. The Millerett has purchased a 10-stamp mill, which will be erected during the winter. There is also a large tonnage of high-grade ore blocked out, so that the shipments from this property will be maintained. The Miller Lake-O'Brien will also be a shipper this winter, as the development has been most satisfactory. On the 150-ft. level, the vein has been opened up for 300 ft., and shows high-grade ore all the way. Several other mines in the district are also obtaining satisfactory results, and small shipments may be expected from some of these.

Both the Nipissing and Crown Reserve mines are carrying out extensive experiments in concentrating in order to decide on the best method for low-grade ores. Although the ore from Cobalt mines concentrates readily, a great many changes and experiments were necessary before the processes now used were evolved. Mines like the Nipissing and Crown Reserve, with their large reserves of high-grade could easily afford to wait until the other mines had their concentrators in operation, and so get the benefit of their experience, and avoid their mistakes. Although excellent results are being obtained from the mills now running there is still room for improvement. Cyanide plants are in operation at three of the mines, but the process is not favorably considered by many millmen. The process men are also busy on the Cobalt ore-treatment problem.

Toronto

Dec. 5—The Ontario government on Nov. 29, passed an order-in-council providing for the construction of a branch of the Temiskaming & Northern railway, from the main line, near Kelso, to Porcupine. The distance will be 30 to 32 miles and the cost is estimated at $450,000. J. L. Englehart, chairman of the company, states that the construction will be begun in about two weeks and that the junction with the main line will be about two miles north of Kelso. The road, he says, should be in operation by July, 1, 1911. The plans also include a further continuation of the line for about five miles to the Metagami river, but this may not be built for some time. The country offers no great engineering difficulties, but a 400-ft. bridge may be required at Night Hawk lake. The road may be operated by electricity. Some time since the Government granted a charter to local interests for a railway into the Porcupine district to connect with the Temiskaming & Northern Ontario railway near Matheson. No action was taken, however, within the time limit specified in the agreement and the charter was afterward disposed of to E. A. Wallberg, who has recently been pushing the work and claims to have 250 men employed in grading. The Government will probably purchase the material for this construction.

The announcement of the Government's action has given a great stimulus to speculation in Porcupine claims and many transfers at high figures are reported, and it is anticipated that numerous flotations of a doubtful character will be placed on the market. The matter of checking "wildcat" operations by further drastic legislation is receiving the attention of the Government. Hon. Frank Cochrane leaves next week to make a personal inspection of the Porcupine field and on his return the policy of the Government in this regard will be formulated. In the meantime, the existing requirements as to issuing of prospectuses and advertisements and the payments of commissions will be rigorously enforced.

The winter roads into Porcupine are in fairly good shape, and freight and passenger trips are being made regularly. Large quantities of supplies are being sent in, and as reasonable freight rates can be obtained, this will mean much greater activity among the working properties, and the opening up of a number of new ones. On account of the lack of supplies development work during the summer and fall has been greatly restricted, but now with adequate transportation facilities, work can go ahead all over the district. A large number of claims are being purchased and during the last week sales aggregating $500,000 were recorded.

THE MINING NEWS

Reports of New Enterprises, New Machinery, Installations, Development Work and Property Transfers The Current History of Mining

Alaska

Quartz strikes are reported in the McKinley Lake district near Cordova, and on the Bonanza and American creeks in the Haiditarod.

Valparaiso—This company is considering the installation of a stamp mill for the property in the Ketchikan district in the early spring.

Nevada Creek—The management of this company is considering the purchase of a 200-stamp mill for this property near Juneau. P. C. Stoess, Seattle, is interested.

Wakefield, Ickis & Powers—Mr. McIkis has charge of the development on this property at McLean's arm, and reports success.

Alabama

W. W. Jacobs, of New Haven, Conn., president of the Shelby Iron Company, in the Birmingham district, is inspecting the Alabama properties. The Shelby company has had its furnace on charcoal iron in full operation for some time now, with but small accumulation of product.

Following a statement by John A. Topping, chairman of the executive board of the Republic Steel and Iron Company that his company was not interested in any probable merger of independent coal and iron companies in this district, talk of such a merger has dropped.

It is announced that the big plant of the American Steel and Wire Company, under construction at Ensley, a short distance from Birmingham proper, will be ready for operation by June, 1911. All work on the plants of the subsidiary companies of the United States Steel Corporation in the Birmingham district is being rushed; the expectation being to complete the great part, if not all of it, by the middle of summer.

Arizona

Cochise County

The Western Mining and Development company of Chicago is negotiating for extensive property in the Swisshelm district. Frank Dean is representative.

Sunnyside—This property, five miles west of Bisbee, is being developed by a Utica, N. Y., company of which Benjamin Smith is president.

Centurion—This copper property, at Dragoon, has made contracts to ship to the Benson smeltery which, it is said, will start up soon. The mine is developing extensively. J. P. Richardson is manager.

Gila County

Inspiration—Manager Drummond telegraphed, Dec. 1, that the ore reserves had been increased to 14,983,000 tons averaging over 2 per cent. copper and 3,502,100 "partially developed ore." Edmund C. Converse and Albert H. Wiggin were elected directors in place of O. J. McConnel and T. Zimmerman.

Graham County

Activity is renewed around Twin Peaks. The Dark Thunder company is developing in charge of W. C. Marshall and several prospects are being explored.

Pinal County

Mammoth—This property, known also as the Goldfield mine, 20 miles east of Mesa, is being developed by a company headed by George U. Young, secretary of the Territory. The ten-stamp mill has been in operation on a test run recently with satisfactory results. It is proposed to raise additional capital and to continue the development and to enlarge the mill.

Yavapai County

Consolidated Arizona—Developments at the property, near Humboldt, are reported favorable, particularly at the Blue Bell mine, on the sixth level.

Yuma County

Golden State—This company in the Whipple Wash district near Parker is planning a concentrating mill.

Arkansas

Arkansas & Superior Zinc Mining Company—This company has been organized at Hancock, Mich., to develop the Keystone and other properties in section 6, township 19, North Range, 17 west. Drilling is underway. John J. Eichkern is secretary.

California

Amador County

Bunker Hill—The ore being taken from the 1950 level is of almost the same grade as that on the 1750 level. The addition of 20 stamps to the mill will permit them to begin the year with 40 stamps.

Butte County

Frisco—Schmitz Brothers have located a mill site near Mooretown, and additional stamps will be put in the mill for this mine.

Mineral Slide—Cohn & Goodday, who recently purchased this mine at Magalia, are putting in a new amalgamator, invented by the superintendent, Stephen P. Moody.

Eldorado County

Charles Kretcher and Grant Busic have found a rich shoot of ore just south of the Union mine, three miles from Eldorado. The vein is 4 ft. wide and carries free gold.

Union—This mine at Eldorado, has closed, owing to the water rates having been raised.

Humboldt County

Horse Mountain Copper—The extensive copper deposits of this company, and of the Humboldt company, at Horse Mountain, have been placed under bond.

Kern County

Red Rock—A number of placer claims have been located in Red Rock district and the ground is being drilled.

Sierras Butte—A compressor has been installed on this mine, at Sierra City, and the 40-stamp mill will soon be started.

Mariposa County

Crown Lead—This company, on the Merced river, at the Nameless dam (Bagby), has brought a Sullivan compressor and a hoist. Twenty stamps are working, but the capacity of the mill will be doubled. Crown Lead company has offices at No. 1 Broadway, New York.

Comet—This company, owning mines near Jerseydale, has just shipped in three cars of machinery.

Modoc County

Big Four—Machinery for a mill for this company has been shipped into Hoag district. A cyanide plant will soon be installed.

Nevada County

Golden Gate—At this mine, Grass Valley, W. P. Martin, superintendent, the steam hoist is being replaced with an electric one, and the mine will be reopened.

Excelsior—Arrangements are being made to operate this Meadow Lake mine all winter. R. E. L. Townsend, of Denver, is the principal owner and Charles Chambers, superintendent.

North Star—This company, at Grass Valley, has encountered the lode in the Cincinnati Hill mine, which is reopening. Pipe lines are being laid for air and water from the North Star plant.

Coan—At this mine, Nevada City, a double compartment shaft is being sunk and hoisting and pumping machinery installed. The mine is under bond to C. D. McConigal.

Morning Star—This mine, near Nevada City, owned by John Curnow and under

bond to Berkeley capitalists, will be reopened, pumped and retimbered. There is a mill on the property.

Prudential—The water has finally all been taken out of this Grass Valley mine which can now be worked all winter.

PLACER COUNTY

A. W. Nichols has applied to the California Débris Commission for a permit to mine the Queen City and Bear River Hill mines, near Dutch Flat, by hydraulic process.

Annie Laurie—The last crushing of ore from this mine, near Coalfax, owner by the Begole Mining Company, R. H. Young, superintendent, is reported satisfactory and more ore will be milled.

SAN BERNARDINO COUNTY

T & T Mining Company—This company is developing near Riggs station, near the Alta mine and the Tecopa Consolidated. W. P. Lemley, Pittsburg, Penn. is president.

SHASTA COUNTY

Mammoth smeltery at Kennett will blow in its third furnace soon. No attempt will be made to blow in the fourth furnace in the year future.

SIERRA COUNTY

Middle Yuba—This quartz mine, near the Nevada county line, has been bonded by E. A. Bauder to Walter Bernard, of Jamestown.

Gold Cañon—This Alleghany district mine, under bond to E. M. Parrish, is in charge of G. W. Woodman, who has men extending the lower drifts with hand drills.

Independence—At this mine, on Wolf creek, F. A. Pierson, manager, the ditch is nearly finished and work on the dam begun. A compressor is being installed.

SISKIYOU COUNTY

The suction-type dredge, at Hamburg, owned by the Northern California Dredging Company, of Eureka, Humboldt county. has closed down for the season and a number of improvements will be made.

TUOLUMNE COUNTY

Wickham—Santa Monica men who are prospecting this mine near Rawhide, have started the 5-stamp mill to test the ore. The mine is owned by W. P. Huston and others.

Tarantula—The mill at this mine, Jacksonville, owned by the United Mining Company, will soon be ready.

YUBA COUNTY

Boston Consolidated—This company at Brown's Valley, has let a contract for a 300-ft. tunnel.

Tarr—This property, at Smartsville, will be reopened. About 100 men are doing preparatory work for operations on a large scale on the Blue Point hydraulic mine, which will be worked on a new system. E. W. Tarr is superintendent.

Colorado

CLEAR CREEK COUNTY

The Santiago mine, above Georgetown, is reported to have shipped 17 cars of ore during the past 30 days, which netted $1000 per car. This mine has been acquired by the North American Smelter and Mines Company, operating the Golden smeltery, where all the ore from the Santiago will be treated. J. H. Robeson is consulting engineer for the smelting company. The same company controls the Donaldson mine, at Idaho Springs, in which a strike is reported in a drift which cut the Donaldson vein 1700 ft. from the Rockford tunnel, which is in 2200 ft. The vein where opened is 1000 ft. below the surface, and is 4 in. wide, carrying 17 oz. gold and 65 oz. silver per ton.

Another three-mile tunnel is projected from the Golden Gate group, on Lenawee mountain, near Montezuma, in Summit county, through the range to the Clear Creek side. It will be built by the Clear Creek & Summit Company, and will be a transportation and drainage tunnel.

LAKE COUNTY—LEADVILLE

Valley Shaft—In this property, in South Evans, is reported 3 ft. of solid ore on the footwall, and 6 ft. of ore on the hangingwall, that runs 2 oz. gold per ton, with good silver and lead values, and says that he walked 600 ft. along a drift in solid ore. This is said to be at a depth of 450 ft. and is in the Cambrian quartzite. This is the northern extension of the Cleveland vein.

Fanchon—Shipments of silver-lead ore, worth from $60 to $85 per ton, are being made by John Christensen from this mine, on Sugar Loaf. The vein is 6 ft. wide.

Black Dinero—Two feet of lead ore, carrying 300 oz. silver per ton, has been opened in this mine, also on Sugar Loaf, by Frank Cullen, leaser.

Agassiz—P. Breen is shipping again from the old Agassiz shaft, in Stray Horse gulch, from which he took a small fortune years ago. This time, however, the ore is carbonate of zinc.

Nevada—The ore bins of the Nevada, on Breece hill, are full of the lead ore recently opened at 60 ft. from the surface, and shipments are to begin at once.

Gold Coin—A tunnel has been driven into the hill at this mine, in Half Moon gulch, and has cut a streak of ore 1 ft. wide that is said to yield from $60 to $100 per ton.

Stevens Shaft—From this shaft, on Rock hill, carbonate of lead ore and smithsonite are being shipped regularly.

Hayden—Forty tons per diem of carbonate of zinc ore, stated to yield 40 per cent., are being shipped from this shaft on Fryer hill, by Burton & Co.

SAN MIGUEL COUNTY

The shipments from the Telluride are about 3000 tons per month of concentrates and crude ore.

Smuggler-Union—This mine is reported to be working 240 men underground, with a monthly output of 15,000 tons, which is treated in two stamp mills and a cyanide plant, owned by the company.

Black Bear—Thirty-five men are employed in this mine and mill, the output being 16 cars of high-grade concentrates per month. A two-mile overhead tramway brings the ore from the mine to the mill.

Tom Boy—Two hundred men are employed at this gold mine, in Savage basin, with a monthly profit realized of about $25,000.

Japan—Seventy-five men are working on this silver-lead and zinc mine, and it is stated to be paying.

Liberty Bell—This mine is stated to be producing about 375 tons of ore daily and to be employing 240 men.

SAN JUAN DISTRICT

Camp Bird—In October the mill crushed 6827 tons; the receipts were $166,521 and the net profit $110,587.

TELLER COUNTY—CRIPPLE CREEK

Maid of Orleans—This mine has been leased by M. B. Burke, owner of the Henry Adney mine adjoining. A good surface equipment has been added at a cost of $10,000, and the shaft will be sunk from 480 to 1000 ft. These are Beacon hill properties.

Portland—Pres. F. G. Peck says that the success of the Battle Mountain mill, which has been treating 800 tons of ore per month, has brought under consideration the question of enlarging it, and that the immense amount of low-grade ore in the district warrants the building of another mill by this company, to treat custom ores. At present, however, this new enterprise has simply been under discussion.

Stratton's Independence—Results for October: Production, 1518 tons, averaging 24 dwt., 16 grains per ton. Dump ore milled, 8200 tons. Net working profit, $10,115.

Idaho

COEUR D'ALENE DISTRICT

Pittsburg Lead—The suit of this company against Patrick Brady and William Goggins over the boundaries of the Panhandle lode claim, which contains a lead-silver oreshoot, has been determined in favor of the company.

Morning—For the first time this unit of the Federal Mining and Smelting Company is shipping crude ore. In the past

nothing but concentrates went to the smeltery. Recent development has opened a better class of ore at great depth.

Golden Chest—A Paris syndicate is negotiating for the purchase of the mine, according to a statement of Edward Baer, of New York, president of the company. This is a gold mine and has shipped much ore. It has been idle for three years.

Indiana

Greene County

Shirley Hill mine No. 1 has been sold to A. M. Ogle, president of both the Vandalia and the Chicago & Indianapolis coal companies. The Shirley Hill mine employs nearly 400 men and is on the Monon railroad; that company has agreed to purchase the entire output of the mine. It is generally believed that the property was sold to Mr. Ogle personally.

United Fourth Vein Coal Company—This company, which owns the Black Creek mine where the tipple recently burnt, is sinking a new shaft about a mile east of the old one. The new shaft is down about 60 ft. and efforts are being made to begin hoisting coal in a short time.

Vermilion County

As a result of sinking two mines by the Bunsen Coal Company, south of Clinton, a town has been laid out to be known as Chun's Ford.

The Steel Corporation mine in this county will be the largest in Indiana, and will employ a large number of men when opened up. The company will build some houses, but the majority of the miners will live in Clinton because miners' trains run out daily.

Missouri

Sunrise Iron and Mining Company—This company has been organized to develop an iron deposit near Bangert, in Phelps county, on the St. Louis & San Francisco railroad. It is said to contain red hematite free from sulphur. The company is now sinking a shaft to prospect the deposit. W. A. Bright, Liberty, Mo., is president.

St. Francois County

Jake Day—Boston parties have acquired this property on Big river, near the No. 11 shaft of the St. Joseph company and are sinking a shaft that will be 400 ft. deep. This is the first new enterprise that has been started in the disseminated lead belt since 1907.

St. Joseph—A large brick office building is being erected at Bonne Terre to replace the wooden structure that has had several narrow escapes from fire. A large hospital is being built on uptodate lines to replace the structure erected about 15 years ago. A brick stack is under construction at the smeltery at Herculaneum that will be 360 ft. high and have a diameter of 20 ft. It is built on a cement pile and concrete foundation and all the furnace gases from the blast furnaces and roasters will be conveyed to it.

Doe Run—Several men were recently injured at the Central power station from the explosion of one of the gas producers (down-draft) that was caused by the bursting of one of the boiler tubes.

Montana

Butte District

Anaconda—The shaft at the Belmont mine is down 1500 ft. and sinking is progressing at the rate of 60 ft. per month. At the St. Lawrence mine the work of constructing ore bins is under way. The 2000-ft. shaft has already been retimbered from the bottom up to the 1600-ft. level and this will be continued up to the 500-ft. level.

Goldsmith—Leasers working the mine have made a gold-silver strike on the 100-ft. level of this property north of Walkerville. The mine has produced over $1,500,000 since discovered but has not been worked recently. C. W. Ellingwood, of Butte owns the property.

Broadwater County

Dry Creek—Development work has been done on these coal mines recently, a 250-ft. shaft having been sunk at a 45-deg. angle. The shaft will be sunk another 100 ft. and will then produce about 150 tons daily.

Fergus County

Barnes-King—Stockholders have recently received a report from President W. H. A. Fischer together with reports from former manager George T. McGee and Treasurer J. A. Bailey, Jr. The treasurer's statement shows assets as $274,056 and liabilities as $3011. The manager's report gives a brief history of the development of the property up to Aug. 1910, at which time it was decided to shut down. Since then operations have been resumed under the direction of John L. Bright.

Granite County

Montana Frisco—The company is capitalized at $300,000 with shares of the par value of $1 each, and owns the San Francisco group east of Philipsburg. A surface plant consisting of a hoist, boiler, pumps, compressor and electric lighting plant have been ordered as well as material for several buildings and work of grading for the buildings has begun. The property carries chiefly silver with some gold and lead. The officers follow: President, T. L. Lammers, of Spokane; vice-president, Lawrence Donlan, of Philipsburg, Mont; secretary-treasurer M. W. Neary, of Spokane.

Jefferson County

Boston & Corbin—The shaft should reach 1000 ft. by Jan. 1, and the property will then be explored at that depth.

Corbin Copper—The tunnel on the Dewey claim is in 1000 ft. and a winze has been sunk 16 ft. but work on the tunnel has been discontinued since the ore can be mined more effectively from the Bonanza tunnel. The latter is in 1000 ft. and will be driven another 300 ft. to connect with the Dewey winze. Between 5000 and 6000 tons of ore have been treated in the new concentrator which according to the management, will be run permanently when the Bonanza tunnel is connected with the Dewey winze.

Chicago & Alta—The property lies near that of the Boston & Corbin company and is developed by means of a 120-ft. shaft which will be sunk to 300 feet. A 5-ft. vein has recently been encountered in the shaft. J. K. Harris is in charge.

Lewis and Clark County

Paddy Norris—The property is near Cañon Ferry about 20 miles northeast of Helena and the ore carries between 60 and 70 per cent. in lead, without silver or gold. Charles Gabisch has recently purchased the mine and has a force at work and a concentrator will be built.

Lincoln County

New Empire Mining and Milling Company—The property is 12 miles southwest of Libby. A contract will be let for 500 ft. of drifting.

Shaughnessy—The lower tunnel is now in 200 ft. and will be driven another 300 ft. When completed the tunnel will tap the orebodies at a depth of 180 feet.

Snowshoe—For several weeks work of pumping the water out of the 400-ft. shaft has been in progress and it appears that operations at the mine will be resumed although no statement has been given out. The mine is 12 miles south of Libby. Friction among the owners has prevented any work for four years.

Nevada

The Eureka & Palisade railroad, which was partially washed out last February and since then has been out of operation, has been sold under foreclosure and purchased by the United States Smelting, Refining and Mining Company, which will rebuild the line in order to bring out the ore of the Richmond-Eureka mines.

Humboldt County

Michigan-Nevada Mines Company—This property in the old Star district, 15 miles southeast of Mill City, has been acquired and will be operated by Canadian and New York capital. There are 30 mineral claims, the development consisting of a 200-ft. shaft and several tunnels, totaling 1600 feet.

National Defiance Mining and Leasing Company—A hoisting plant has been in-

stalled. The lease shaft is now down 200 ft. on the Charleston Hill property.

LANDER COUNTY

Kimberly Consolidated—A body of rich ore is reported opened on the Hill Top claims. From the Independence ground regular shipments are being made. Foundations for a 60-stamp mill are in.

LINCOLN COUNTY

The final papers have been signed for the merger of the Nevada-Utah, Prince Consolidated. Prince Centennial, Ohio-Kentucky and the Consolidated Pioche properties of the Pioche. An issue of $500,000 bonds of the consolidated company it is said, has been underwritten, and the money will be available as soon as the transfer of the properties has been completed. The proceeds of the sale of bonds will be used in the construction of a 500-ton concentrating mill. The name of the new corporation, it is said, will be the Amalgamated Pioche Mines Corporation.

Yellowpine—This zinc mine, at Goodsprings, will install a concentrating plant.

WHITE PINE COUNTY

John Steele and Richard A. Riepe have sold their lead-silver property at Lane City to Jesse Knight and associates of Salt Lake City.

Giroux—It is expected that the Giroux will begin the hoisting of ore through its Alpha shaft in January. The tenth level of the Alpha (which caved a few years ago, closing that portion of its mine) has been reopened and connected with the new big shaft. The 12th level is now being connected.

New Mexico

Anderson Mica Mining Company—This company, operating at Riberia, will establish a factory at Topeka, Kan., for the preparation of its product. H. B. Dickinson, Topeka, is vice-president.

North Carolina

Carolina Ore Company—This company is building works at Winston-Salem, N. C., for the purpose of treating pyrites residues, which will be made into briquets for the use of iron blast furnaces. The residues will be obtained from the large fertilizer works at Winston-Salem, Charlotte and other points in the South.

Pennsylvania

ANTHRACITE COAL

Philadelphia & Reading Coal and Iron Company—The statement for the four months of the fiscal year from July 1 to Oct. 31 shows gross earnings, $8,679,040; expenses, $9,032,842; deficit, $353,802. As compared with the corresponding period in 1909, there was a decrease of $180,961 in gross earnings, and an increase of $197,820 in the expenses; the deficit this year comparing with net earnings of $24,979 last year.

LANCASTER COUNTY

It is stated the old iron mine at Martieville is to be reopened. It is now owned by a Philadelphia syndicate, which took it over after the Segal failure. The mine was operated formerly for a number of years; it was taken up by Adolph Segal, among other enterprises which collapsed with his failure. A contract has been let to rebuild the spur track which connected the mine with the Pennsylvania Railroad at Safe Harbor.

South Carolina

Paragon Kaolin Company—This company has been organized to develop kaolin deposits in Aiken county. The office is at Langley, S. C.; W. R. Eve, of Ariquita, Ga., is at the head of the incorporators.

Utah

JUAB COUNTY

Yankee Consolidated—Kellogg & Scott, the contractors, who have been sinking the shaft to the 1300 level have been given the contract for 400 ft. more of sinking.

Victoria—The shaft on the Eureka side is now below the 1100, and as soon as the pump is cut, active development will be started for orebodies in this neighborhood.

Tintic Standard—Drifting on the 700-ft. level along the contact of limestone and quartzite has opened several bunches of good ore, but not in shipping quantity. Work is also being done on the 1000-ft. level.

Clift—Good ore has been opened on the old Susan property at Silver City, controlled by this company, and a 50-ton shipment is ready for the market. Frank Thornberg has a year's lease, at the expiration of which, work will probably be started on company account.

Colorado—The last report shows that the cost of mining, including prospecting and development, has increased from $3.32 to $7.21 per ton. This increase is due to more extensive prospecting, and to the fact that a smaller tonnage is being shipped. The payment of dividends this year was practically 80 per cent. of the smelter returns on the ore marketed. There are no liabilities except current operating expenses and taxes. During the year arrangements were made to lend the company's surplus cash on demand notes at 2 per cent. interest, ample security being provided. This brought in $1529. There is $64,500 outstanding on these loans. Recent tests have been made on the silicious ores, and the advisability of erecting a cyanide plant is being considered. A diamond drill has been purchased, and will be used for prospecting.

Chief Consolidated—The report that a consolidation of East Tintic properties was being brought about by this company has been denied by Manager Fitch, who states that the Chief Consolidated is not in any way connected.

Iron Blossom—Work is being done on the 800-ft. level, south toward the Govenor lines. Ore has been encountered in small quantities. It is thought the December dividend will be passed unless a market for the silicious gold-silver ores is obtained.

GRAND COUNTY

Green Mountain Gold and Copper—A stipulation and order has been entered by Judge C. W. Morse in the case of W. Johannes vs. the Green Mountain Gold and Copper Company and three of its officers, by which a special auditor will be named by the court to look into the company's affairs. The officers are charged with issuing stocks to relatives without authority or consideration, also with creating an over issue by selling something like 150,000 shares additional to other persons payable on installment, there being no stock in the treasury, according to the complaint, with which to meet this issue. There are other charges alleging that the officers appropriated 10 per cent. of the purchase price of stock sold, as commissions, and a failure to account for the company's funds. A receiver and accounting is asked for. The property consists of eight unpatented claims in the La Sal district, about 30 miles from a railroad. No work is being done at present.

PIUTE COUNTY

Shamrock—A car of ore was shipped from this property near Marysvale recently, on which settlement was made for 21 tons running $32.20 in gold, 37 oz. silver, and 6 per cent. copper. This brought $64 a ton, making $1344 for the car. Development is being done on the Taft claim, where a new find of ore, carrying silver and lead is reported.

Cascade—A raise is being driven from the tunnel level to the surface for ventilation.

Jesse—Assessment is being done on this claim, formerly known as the Grand View, which adjoins the Wedge and Dalton groups.

Wedge Consolidated—Arrangements are being made to resume work on this property. Rich ore in small quantities has been developed.

Bully Boy & Webster—The second car from the DeWitt lease, which expired the middle of November, has been shipped. Work on this part of the property will be continued by J. W. Young and associates, who have two years' lease and bond on the group of 10 claims.

Ohio Copper—Tables are being installed in the second section of the mill. The present capacity is around 1600 tons of ore daily.

Last Chance—A lease has been taken on this property at Bingham by Morris P. Kirk, who was formerly superintendent. Subleases will probably be let. The Last Chance claims lie between the Utah Copper and United States Mining Company ground, and have been opened by three tunnels. The longest of these is 3800 ft., and gives a depth of 900 ft. on the vein. The property is owned by the Nevada-Utah.

Bingham Mines—The buildings and equipment of the Commercial mine, which were removed from Copper Center gulch to the mouth of the Niagara tunnel, have been put in working order. Practically everything except the ore bins is in place, and ready for operation. Work has been started, and 300 ft. driven of the 1000 ft. necessary to connect the Niagara tunnel with the Commercial workings. Between 9 and 10 ft. progress have been made daily. At the Dalton & Lark property, owned by this company, a hoist has been installed on the 1600 level, and ore from the old Brooklyn is being hoisted, and sent to the Mascotte tunnel level, from where it is taken out to the bins on the railroad.

Columbus Extension—Shipments to the Columbus Consolidated mill have been suspended, owing to lack of power. The extension recently broke into 4 ft. of shipping ore.

Columbus Consolidated—The principal development is being done in the eastern part of the property on the 425-ft. level.

Utah Mines Coalition—A winze is being sunk on the shipping ore first encountered in the main tunnel. Raising is also being done. The tunnel has been extended 125 ft. beyond this ore, and has 5 ft. of ore in the face, which carries 64 oz. silver, 8 per cent. copper, and between 6 and 8 per cent. lead. Some specimens of ore showing crystals of wulfenite or lead molybdate, are on exhibition at the local offices. At present development and shipments are limited by the changes being made in the equipment. Electricity is being substituted for gasolene power formerly used. Temporary water facilities had to be provided, owing to the disappearance of Lake Solitude, from which water was obtained for culinary purposes. Shipments will be resumed, when the changes in equipment have been made.

Rexall—A contract has been given to G. Malmborg for driving the tunnel another 100 ft. A small mineralized fissure was cut recently. The face is in 860 feet.

Utah Copper—Condemation proceedings were filed against the Niagara Mining and Smelting Company in the district court Nov. 21. The Utah Copper Company wants the ground involved for dumping purposes.

Washington

Ferry County

Knob Hill—This company is considering the installation of a compressor plant. Joseph McFarland, Republic, is superintendent.

Little Giant—This property, in the Orient district, has been sold to the Canadian Mining Operators, Ltd., of Vancouver, B. C.

Rathbon Reduction—This plant is about completed. The first ore to be treated will be the tailings from the Republic mill, and then the ore from the Ben Hur mine.

Whatcom County

A strike of free-milling ore in the northern part of Whatcom county, along the Skagit river, is causing excitement.

Whitman County

Hoodoo—J. C. Northrup, Palouse, manager, reports the return of 5.78 per cent. copper from a recent shipment. Operations at this property will be continued.

Wisconsin

Little Minnie—This mill at Benton was destroyed by fire; the plant will be replaced at once. William Haak, Madison, Wis., is president and Philip Vaughn in manager.

Wilkinson—The Vinegar Hill company, of Galena, Ill., has taken a 90-day option on this property and is building a portable mill of 12 tons capacity.

Roosevelt—This property has been acquired by the Knox Mining Company. Development has shown up a body of disseminated zinc ore.

Schrier—This company has completed a 20-ton mill east of the Etna; A. Kasch, Shullsburg, Wis., is manager.

Canada

British Columbia

British Columbia Copper—Two of the three blast furnaces at this company's smeltery, Greenwood, having their hearth area increased 50 per cent., the treatment capacity of the furnaces is now one-third larger than before, the maximum being 2600 tons per day. Ordinarily the tonnage treated daily is 2400 to 2500 tons, as compared with 1800 tons prior to the changes. The plant for feeding ore to the furnaces and hauling away slag has been increased proportionately.

New Dominion Copper Company—The Rawhide mine, near Phœnix, Boundary district, is shipping 600 tons of ore daily to the British Columbia Copper smeltery, Greenwood, and arrangements are being made for a large output up to 1000 tons daily.

Molly Gibson—The Consolidated Mining and Smelting Company has acquired this silver-lead mine, near Nelson, and is constructing an aërial tramway 4½ miles toward the landing on Kootenay lake. The higher-grade ore will be shipped to Trail, and the second grade concentrated at the mine.

Standard—The lode in No. 5 tunnel of this Slocan lake mine maintains its unusual width, with up to 20 ft. of galena ore of shipping grade. Much of the ore shipped averages 65 per cent. lead and 75 oz. silver per ton.

Center Star—A recent important development in the War Eagle mine, of the Center Star group, Rossland, was the finding of a shoot of ore assaying up to 3.24 oz. gold per ton. The examples were taken over a width of 5 ft. The ore was entered by the diamond drill at 75 ft. below the 12th level. The group is owned by the Consolidated company.

Van Roi—The aërial tramway has been removed from the western to the eastern side of the mountain and the eastern outlet of the mine connected with the new concentrating mill now nearing completion. Development has been continued in the mine, but no ore has been stoped pending completion of the mill. Much concentrating ore has been opened, the average assay value of one shoot 360 ft. long having been 6.5 per cent. lead, 11.8 per cent. zinc, and 16.68 oz. silver per ton.

Nova Scotia

Dominion Steel Corporation—The output for November was as follows: Pig iron, 23,122 tons; steel ingots, 26,025 tons; blooms, 23,083 tons; rails, 13,425; rods, 7488 tons; coal, 325,000 tons. President J. H. Plummer states that a controlling interest in the Cumberland Railway and Coal Company will be transferred to leading directors of the Steel Corporation. This will give them control of the valuable Cowans coal areas at Springhill.

Ontario

The shipments from Cobalt for the week ended Nov. 25 were: Drummond, 480,000 lb.; Nipissing, 338,610; Coniagas, 190,300; McKinley-Darragh, 176,540; La Rose, 147,050; Kerr Lake, 120,450; Cobalt Lake, 114,300; Crown Reserve, 66,000; Right-of-Way, 64,000; Temiskaming, 60,000; Buffalo, 52,600; Trethewey, 43,400; total 1,853,250 pounds.

Hargraves—At the 375-ft. level of the No. 3 shaft, another vein of high-grade ore has been cut on this Cobalt property.

City of Cobalt—In this Cobalt mine a new high-grade vein has been found on the 265-ft. level.

Powerful—This Gowganda company will shortly purchase a plant for installation on the property at Calcite lake.

Valentine—Operations will shortly be resumed at this Cobalt property.

Bishop—This Gowganda property will install a plant near Calcite lake.

Beaver—Ore running 4000 oz. of silver to the ton is reported to have been encountered in a vein 7-in. wide in the winze at the 300-ft. level in this Cobalt mine.

La Rose—General Manager Watson reports that on the Lawson property between 40 and 50 ft. of very high-grade ore has been developed at the 188-ft. level, the vein averaging 6 to 8 in. wide and having every appearance of continuity. An average of eleven assays of the ore in the center of the drift gives 4618 oz. The development is important as showing that high-grade ore may be found in the Keewatin at depth below a lean or barren outcrop.

Ontario-Porcupine

Gode Burns—This group of claims in Shaw township has been sold by Thomas Reilly to Toronto buyers at a price stated to be about $100,000.

Walsh—The three Walsh claims in Eldorado township have been sold under option to Montreal and New Brunswick interests. The purchase price is stated as $50,000 for a 90 per cent. interest. Quartz veins showing free gold have been found in crosscutting.

Quebec

Dominion Goldfields of Canada—This Montreal company is constructing a canal in Beauce county to bring about 1000 miners' inches of water from Lake Fortin down to the Des Meules gold alluvion, about 1½ miles from Beauceville. Four and one-half miles of the canal and eight flumes of a total length of 4000 ft. have been finished. The grade is 1: 600. The ultimate head will be about 250 ft. Two monitors in conjunction with a mechanical elevator will be used in hydraulicking the rich river banks. On account of the severe weather, drilling operations with the Keystone and Empire and other exploring work, which has been going on for the past season in different parts of the Seigneurie, have been suspended, but will be taken up again early in the spring, 1911.

Belmina—About 75 men are employed at the asbestos mines, six miles from Coleraine station, on the Quebec Central railway. Two pits are in operation; the milling plant, which has undergone many changes since the present company took hold of it, treats as an average about 125 tons of mill rock. The capacity is 500 tons in double shift.

Yukon Territory

William Moore and associates, of Dawson, have located nine claims in the Bonnett Plume country. A fine placer strike has also been made at the mouth of Goring creek. The gold is coarse.

Mexico

The political unrest in Mexico last month appears to have been suppressed pretty generally except in the mountain region west of Chihuahua city. No damage to and but little interference with American mining operations has resulted anywhere.

Chihuahua

Dos Cabezas—It is reported that this mine, at Nueva Casas Grandes, has been sold by Frank Lewis to Juan Terrazas, of Chihuahua, for $70,000.

Guanajuato

Guanajuato Mining and Milling Company—The company controls the following properties in the Santa Rosa district: San Cayetano y Anexas, La Indiana, Santo Tomás, San Guillermo, San Juan y San Carlos y Ampliación and Pasado Mañana, comprising 409 acres; the Noche Buena, San Julio and Florodora, comprising 46 acres, in the Peregrina district; and the Santa Rosa del Nayal and the Santo Niño, comprising 40 acres, in the Nayal district. Development has been carried on in all of these properties for two years. There is reported in sight in old dumps and in mines 80,000 tons of ore averaging 16 pesos per ton. Five shafts will be equipped with electric hoists. The Santa Rosa mines will be connected by electric and aërial tramway with a new 100-ton all-slime cyanide mill, which it is expected will be in operation by December, 1911. Chester A. Fulton is manager. The stock has been listed on the New York Curb.

Guanajuato Consolidated—In the three months ended Nov. 1, the mill crushed 23,255 tons with a total recovery of 289,126 pesos and an operating profit of 74,829 pesos, of which 36,240 pesos were spent on development, accomplishing 893 ft. of development work. Joseph MacDonald is manager.

Hidalgo

Cortez Associated Mines—This Boston company is operating in the northern part of the State, carrying on extensive development on copper and gold deposits. Work will be continued. Olaf Wenstrom is engineer in charge.

Lower California—San Antonio District

Compañia Metalúrgica de California—The installation of the Butters filter press and the Pachuca tanks for agitation is nearing completion. Contracts are being made to transport a portion of the required 50 tons per day of ore, which will be taken from the Frontera properties, five kilometers from the mill.

San Juanes Reduction Company—This plant is running smoothly and the results are satisfactory. The management intends to erect a roasting furnace to treat the large reserves of good grade sulphide ores.

Todos Santos—This portion of the Baja California is attracting attention. In one week there were six denouncements. Formerly the marble deposit was the cause of interest, but a vein of quartz carrying free gold has been developed.

Progreso Mining Company—This company is running the plant in Triunfo full time, and the small plant in San Antonio also.

San Luis Potosi

The capacity of the Matehuala smelting plant is being increased to 800 tons daily by the erection of a 500-ton furnace. The plant and a number of mines were purchased early this year from the National Metallurgical Company, by the American Smelters Securities Company. With the completion of the new furnace the production of the Dolores mine in the Matehuala camp, the property of the Guggenheim interests for a number of years, will be increased.

Sonora

Mexican West Coast Oil Company—Efforts are being made by this company to purchase a large area of ground, 60 miles west of Cananea, upon which oil indications exist.

San Jose—A hoist and power plant has been placed at this property in the Alamos district.

Mines Company of America—This New York company has leased the Butter's mill in the Creston-Colorada camp and will increase the ore treated by 9000 tons monthly making a total of 16,000 tons monthly. La Dura mine, also in Sonora, belonging to the same company, is now shipping. Plans for the concentrator for La Dura have been made and it is expected it will be completed by June, 1911.

Veracruz

Huasteca Petroleum—From the earnings of this company the Mexican Petroleum Company of Delaware, which owns all the Huasteca stock, has commenced the payment of dividends on its common stock. A dividend of $1 a share has been declared for the present quarter, and it is announced that this rate will be continued during 1910. There are 298,000 shares of common outstanding. The Huasteca Petroleum paid its first dividend, October, $119,127, and made a similar payment in November. In the last four years the Mexican Petroleum of Delaware has paid over $3,500,000 on its preferred stock.

South America

Chile

Braden—It is reported that this company has now developed 7,500,000 tons of ore, averaging 2.93 per cent. copper.

THE MARKETS

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Coal Trade Review

New York, Dec. 7—In the West there are two points of discussion, the car shortage and the increase in rates in Indiana and Illinois. The higher rates will raise prices to consumers, without doubt, but will hardly decrease current demands for coal. Car shortage is, perhaps, a little less acute; but on the other hand heavy storms have interfered with transportation, so that the situation is hardly improved. At most consuming centers coal users are running with small stocks and largely depending upon supplies which reach there from day to day, which is not a desirable situation.

In the East the Seaboard bituminous trade is less active than it has been. Car shortage is felt to some extent, but is less pronounced than in the West.

The anthracite trade is steady, perhaps a little more active than usual, but without special incident.

Illinois Coal Rates—The Illinois Railroad Commission has approved the general increase in freight rates on coal proposed by the railroads of the State. The advance is about 7c. per ton, and takes effect during the present month. A similar increase has been approved by the Indiana Railroad Commission.

Coal Traffic Notes

United States Coal Exports—Exports of coal and coke from the United States, with coal furnished to steamships in foreign trade, 10 months ended Oct. 31, long tons:

	1909.	1910.	Changes.
Anthracite.....	2,359,661	2,483,413	I. 123,752
Bituminous	8,102,784	9,105,787	I. 1,003,003
Total exports..	10,462,445	11,589,200	I. 1,126,755
Steamer coal.....	5,134,154	5,417,517	I. 283,363
Total.....	15,596,599	17,006,717	I. 1,410,118
Coke..... ...	730,720	715,146	D. 15,574

Canada took this year 8,870,240 tons of coal, or 76.5 per cent. of the total exports. Cuba took 681,261 tons of coal. The coke wently chiefly to Mexico and Canada.

United States Coal Imports—Imports of coal and coke into the United States, 10 months ended Oct. 31, long tons:

	1909.	1910.	Changes.
Anthracite.....	2,125	162	D. 1,963
Bituminous.....	993,720	1,628,111	I. 634,391
Total coal.....	995,845	1,628,273	I. 632,428
Coke.....	143,150	120,113	D. 23,037

Canada furnished this year 1,386,091 tons of coal and nearly all the coke; Australia, 176,710 tons of coal; Japan, 51,537 tons of coal. Imports are chiefly on the Pacific Coast and in the far northwestern States. Anthracite imports not reported since July 1 of this year.

New York

Anthracite

Dec. 7—The weather has been cold and generally favorable to trade. At this time of year we are apt to have a good deal of a weather market, and the present time is propitious for the trade. At the same time a heavy snowstorm is interfering with local deliveries. Steam trade is active.

Schedule prices for domestic sizes are $4.75 for lump, $5 for egg and stove and $5.25 for chestnut, all f.o.b. New York harbor. Steam sizes are unchanged. We quote for pea, $3@3.25; buckwheat, $2.25@2.75; No. 2 buckwheat or rice, $1.80@2.25; barley, $1.40@1.75; all according to quality, f.o.b. New York harbor.

Bituminous

Demand is still rather quiet and buying is limited for the time being. The call for the shoalwater ports has been cut off by cold weather, ice enough having been formed to stop navigation.

Gas coals are about the same, ¾-in. bringing $1.10@1.15 at mines, and run-of-mine $1@1.05. Low-volatile steam coals can be had at $2.75@2.85 for lower grade, and up to $3.10@3.20 for better sorts, all f.o.b. New York harbor.

Car supply is rather irregular. Transportation is slow, on account of the heavy snowstorm of this week, which has blocked several roads; and has also interfered to some extent with harbor deliveries.

Coastwise vessel rates are nominally unchanged, but higher prices have been paid. It is hard to get boats as they do not want to risk stormy weather.

Birmingham

Dec. 5—Coal operations in Alabama are only interferred with by the supply of railroad cars. The coal-car shortage promises to be the worst during this month. There is steady operation at all mines where cars can be had for the business. There is a great quantity of coal still to be mined on orders in hand, while other business is in sight. Reports that many million bushels of coal had started down the rivers from Pennsylvania, some of it destined for the New Orleans market, where Alabama coal has already gained a good foothold, cause no alarm among the operators in this district.

The coke demand is also strong and there is a steady output. Both coal and coke prices are strong.

Chicago

Dec. 5—Under the influence of continued cold weather and the need of large stocks against transportation emergencies, the coal market continues strong. With the ruling of the Illinois Railroad and Warehouse Commission permitting an advance of 7c. per ton on coal from mines in this State, prices on December deliveries have risen generally about 10c. This change has been expected for two or three weeks, with the result that many consumers and dealers loaded up rather heavily before the first of the month. An increase of 10c. applies on all coal from Indiana mines, also, so that the greater part of the Chicago market is affected. The heaviest demand is for these Western coals in all sizes, but Eastern coals have profited also out of the general increase in demand. All sizes and grades of coal hold well up to price lists, there being practically no surplus coal on tracks to cause cutting of prices. The demand for domestic coals is very heavy in city and country, with anthracite scarce in the bins of retailers and consumers, as is shown in the great number of orders received with each cold wave. Steam coals are selling steadily and well, with no signs of serious falling off in the demand.

Illinois and Indiana coals bring $2.20@3.10 for lump, $1.90@2.10 for run-of-mine and $1.50@1.95 for screenings. Smokeless, the most in use of coals from east of Indiana, holds firmly to $3.95 for lump and $3.30 for run-of-mine, with lump the more in demand and shipments of both well regulated. Hocking continues strong and sometimes hard to get, with the price holding firm at $3.40. Gas and special coals are in good supply and find a strong, steady market.

Cleveland

Dec. 5—There will be no extension on Lake insurance from Dec. 1. A few cargoes have gone up in the past week, but at special rates, 50c. having been paid to a Lake Michigan port, and 75c. to Green Bay.

Trade locally continues very active. It is difficult to quote prices, as supplies are irregular and premiums are paid in many cases by those who are in a hurry to get coal.

Indianapolis

Dec. 5—The Indiana Railroad Commission has granted permission to all

railroads in the State which receive coal at the mines, and which base their tariffs on rates into Chicago and Hammond, to increase the coal rate 7c. a ton on interstate shipments. The increase of 10c., which was proposed by the railroads, was thus reduced to 7c., effective at once. The increase affects virtually the entire north half of the State. The permision granted by the commission specified only such shipments as are controlled wholly by the Hammond and Chicago rates. Whether the roads will make the change effective for all points not directly affected by these rates is not known. The 7c. increase is in keeping with the increase in Illinois. The roads concerned asked the Interstate Commerce Commission to file tariffs at once increasing the interstate rates to the same amount, but the Indiana commission has received no word.

It is expected by the commission that the roads will adjust all their coal rates, outside the southern Indiana competitive territory, on the basis established, and that the increase throughout the entire north half of the State will be 7c. In the south half, increases will not be made, in all probability, because of competition with the Indianapolis Southern, which cannot increase its present rate because of its franchise agreement with the city of Indianapolis.

Pittsburg

Dec. 6—The local coal market continues quiet and demand has decreased slightly owin to the general slackening in industrial operations. Car supply is satisfactory. Regular prices which follow are shaded on particularly desirable orders, but hold good for ordinary lots: Mine-run and nut, $1.15; ¾-in., $1.35; 1¼-in., $1.40; slack, 82½@85c. per ton.

Connellsville Coke—The movement for a central selling agency has lost ground in the past week and it now seems improbable that any concerted action will be taken. One of the chief difficulties was the making of a basis for taking in the different grades of coke. As furnaces have become more discriminating and as new parcels of coal have been opened up, the question of quality has assumed much more importance than obtained a few years ago. The market has been almost bare of new developments in the week. The last contract of importance was that of the Youngstown Sheet and Tube Company, covering 28,000 tons monthly over next year, at a ratio of 8 to 1 on basic iron, with a minimum of $1.60, the ratio working out at about $1.65 on the present pig-iron market. A sale of 3000 tons of prompt coke has been made at $1.60, but this was about the best coke the old region produces, so that the price is not indicative of the average run. We repeat former quotations, which are largely nominal: Prompt furnace, $1.40@1.50; contract furnace, $1.75@1.85; prompt foundry, $2@2.10; contract foundry, $2.25@2.50, at ovens.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended Nov. 26, at 285,049 tons, a decrease of 41,000 tons; shipments at 2567 cars to Pittsburg, 4945 cars to points west and 575 cars to points east, a total of 8087 cars.

St. Louis

Dec. 5—The market has settled down to what is a strictly normal basis for this time of the year. It is the first time that we have had what might be called an absolutely normal market for nearly a year and it comes hard for coal operators to realize it. The coal trade is now experiencing the regular dull period after the first fall rush. The chances are that in the course of several weeks, when the consumers are forced to buy again, the market will pick up, though it will take unusual conditions to enable operators to get prices such as they have had during the last three months. Cold weather has started in quite early and has been unusually severe for this time of the year.

The car situation remains about the same. The weather has been very much colder during the last few days accompanied by a heavy snow. This will not improve the movement of cars.

The demand for fine coal is much better and screenings are now bringing about 50c. per ton at mine. Nut and mine-run are also firmer and the standard grade is bringing around $1 at the mine.

Current prices in the St. Louis market are as follows:

	F.o.b. Mine.	F.o.b. St. Louis.
Standard:		
6-in. lump	1.40	1.92
2-in. lump	1.20	1.72
Mine-run	1.00	1.52
2-nut	1.00	1.52
2-in. screenings	0.50	0.92
Pea and slack	0.30	0.82
Staunton, Mt. Olive & Springfield:		
6-in. lump	2.00	2.52
3-in. lump	1.75	2.27
Mine-run	1.40	1.92
2-in. nut	1.00	1.52
2-in. screenings	0.50	1.02
Carterville:		
6-in. lump or egg	1.75	2.42
3-in. nut	1.60	2.27
Mine-run	1.20	1.87
1½-in. screenings	0.75	1.42
Franklin County:		
6-in. lump or egg	2.00	2.67
3-in. nut	1.75	2.42
2-in. nut	1.50	2.17
1½-in. screenings	0.75	1.42
Trenton:		
6-in. lump	2.50	3.02
6-in. egg	2.50	3.02
3-in. nut	2.00	2.52
Pennsylvania Anthracite:		
Chesnut	....	7.20
Stove and egg	....	6.95
Grate	....	6.70
Coke:		
Connellsville foundry	2.50	5.30
Gas house	....	5.00
Smithing coal	1.65	4.15
Pocahontas Smokeless:		
Lump and egg	2.25	4.75
Mine-run	1.25	3.75

Prices at East St. Louis are 20c. per ton below the St. Louis quotations.

Anthracite—The market is good and an unusually large tonnage is coming forward. Chestnut is in heavy demand even at the advanced price. All the large companies have bought heavily on all sizes in order to obtain chestnut; however, they all seem to be absorbed freely and nothing has been up to demurrage in East St. Louis for some time.

FOREIGN·COAL·TRADE

Nova Scotia Coal—Coal shipments from Nova Scotia mines, 10 months ended Oct. 31, long tons:

Company:	1909.	1910.	Changes.
Dominion	2,098,143	2,689,600	I. 591,457
Nova Scotia Steel	650,206	687,906	I. 37,700
Inverness	185,706	221,692	I. 35,986
Acadia	226,796	225,052	D. 1,744
Intercolonial	209,416	197,750	D. 11,666
Total	3,370,267	4,022,000	I. 651,733

The total increase was 19.3 per cent. Two companies showed small decreases; the others considerable gains.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of coal on Nov. 26 as follows: Best Welsh steam coal, $3.96; seconds, $3.78; thirds, $3.60; dry coals, $3.72; best Monmouthshire, $3.54; seconds, $3.36; best steam small coal, $2.34; seconds, $2.10. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, Dec. 7—The conference of steel men, to which reference was made last week, did not result in any positive action. From such statements as have been given out, however, it is evident that there was a general understanding and agreement that prices should be maintained at about the present level; and that there should be no general movement to stimulate business by reducing quotations. Committees were appointed to consider the trade conditions, and it is said that another conference will be held soon. The response to this decision has been a general dullness, which most people in the trade expect will last through December. Quite a number of small building projects are held back, and some other work will wait for a turn.

Pig-iron sales in Eastern territory have been mainly limited to foundry iron for first-quarter delivery. Southern furnaces are hungry for business and are now willing to take $11 Birmingham for No. 2 foundry for such deliveries. In the Central West some business has been done in basic pig and a little in forge.

In finished material bars and structural steel have furnished most of the business going. New orders generally have been light, but specifications on contracts are reported better.

The American Bridge Company has taken a contract to build 20 steel tank barges for the Standard Oil Company. They are to be used in the trade down the Ohio and Mississippi rivers.

Lake Superior Iron Ore—Preliminary figures for the Lake movement of iron ores for the season just closing put the total at 42,620,200 tons, a decrease from 1909 of 63,400 tons.

Baltimore

Dec. 5—Exports for the week included 5,516,800 lb. steel billets to Great Britain. Imports included 3341 tons iron pyrites from Huelva, Spain; 29,680 tons iron ore from Cuba.

Birmingham

Dec. 5—The month of December promises to be a good one in a way with the Southern pig-iron manufacturers. A curtailment of production is on. This condition will prevail throughout the month, perhaps increase. Quite a number of sales have been made lately for delivery during the first three months of 1911 with a few sales for immediate delivery. The quotations have weakened, No. 2 foundry now selling at $11 per ton. It is claimed that there is no profit in iron at $11 per ton, but there is still selling going on at that price and for delivery during the first quarter of 1911. It is expected that with a curtailed production and some selling, the accumulated stocks of iron can be removed. There will hardly be any resumption of operations at furnaces until after the new year. Two furnaces went out of commission last week and it is stated there will be another furnace or two out during the next three weeks. There is about 300,000 tons of pig iron on Southern furnace and warrant yards. Some iron is being shipped out on export orders, but this is not extensive business.

A few inquiries are coming in for iron to be delivered during the last half of 1911. There is no desire expressed in this section to handle this business just yet, and as far as can be ascertained, no orders have been booked.

Chicago

Dec. 5—Quiet conditions continue in the iron market, which probably will not show any marked change until after the imaginary line of the first of the year has been passed. There is a good deal of inquiry for first-half iron and a considerable aggregate of tonnage is booked for first-quarter deliveries in small individual lots. The exceptional contract is for 1000 to 3000 tons or more, for most buyers continue to prefer to come into the market often for their requirements up to 1000 tons. Northern iron holds well to $16.50 for general first-half requirements, with some sales made for December and first-quarter shipment at $16. Southern furnishes the bulk of the first-quarter business, at $11@11.50, Birmingham ($15.35@15.85, Chicago), the higher price being demanded on second-quarter deliveries.

Sales of iron and steel products are in general quiet, with the tendency to caution in making purchases or contracts apparent almost everywhere except in the structural material line, where considerable tonnage is in sight.

Philadelphia

Dec. 7—The only possible further weakening in pig iron in eastern Pennsylvania will be due to the anxiety of the holders of surplus stock to get rid of it. A few furnaces have been blown out and two or three more may be added to the idle list, but makers are extremely anxious to keep going and will sell down close to cost. Prices have not weakened and the amount of business done is trifling. Even the larger concerns are buying in a hand-to-mouth way and in two or three cases where the buyers were asked to give a reason for this policy at a time when prices could hardly go lower could say no more than that any upward tendency for some time to come was out of the question. Southern makers are canvassing this territory but the best terms they are able to make do not bring out large orders. Makers draw some comfort from the fact that very few consumers have stocks worth mentioning. Today's lowest quotation for good No. 2 foundry is $15.75; for gray forge, $14.50. Basic is nominally $15 per ton.

Steel Billets—Special inducements in the way of concessions brought out some buyers for billets but their orders were small as they are given the opportunity of buying more at the same price within 30 days.

Bars—In view of a possible severe winter, quite a number of buyers in this and more remote territory have ordered iron for sorting-up purposes, and these orders have given a fair week's business.

Sheets—Sheets have fared somewhat better. Consumers have run on extremely narrow stocks for several months. While winter trade is not as good as trade in other seasons, there has been a fairly active buying movement in small lots, which local mill men say is likely to continue until the close of the year.

Pipes and Tubes—Locomotive work is abundant and this source of consumption is the strongest in the tube industry at present. Other smaller interests report work somewhat better than in the fall but it is largely of a repairing character. Merchant pipe continues dull; reports from cast-iron pipe foundries show the usual activity.

Plates—Plate manufacturers are showing anxiety to close on some business that has been hanging fire for several weeks. The placing of some large orders for steel cars is helping steel plate and inquiries are now on the market for something over 15,000 tons.

Structural Material—A better steel-car business is helping out in structural material and four or five orders of some magnitude have been sent to the mills within a day or two.

Scrap—More scrap is selling and its activity is due to the presentation of actual necessity involving immediate shipment. Holders of scrap are willing to let everything go at the low current prices excepting old rails. Heavy steel scrap and railroad scrap appear to be in moderate supply.

Pittsburg

Dec. 6—Iron and steel producers have a clearer conception of the position since last Wednesday's meeting in New York. It is established that there is no particular desire among producers for any reduction in finished steel prices at this time, while there is an important, if not a majority sentiment that there should be reductions at some later time, presumably about the middle of January. Many buying interests, and particularly the railroads, are clearly of the view that prices should be lower on account of the light demand and the decreasing rate of production, even though the iron industry now is not running at over 60 per cent. of capacity. This feeling will probably be accentuated a few weeks hence, for the trend is toward still lower production and still greater need of new business.

The course of the trade in the past six months has been monotonous for its regularity. There has been a continued playing out of old contracts and orders, whereby the volume of unfilled orders on the books of steel companies has continually decreased. Against a small part of the tonnage which has been exhausted new buying has appeared, so that in a limited way buying has increased. This increase has been more or less steady since last August, as mentioned by Chairman Gary in his statement after last week's meeting. It is important to observe, however, that the increase in daily bookings has pretty clearly been due to the exhaustion of old orders, so that the increase has not produced increased shipments to buyers, the rate of shipment, on the other hand, constantly decreasing. The true measure of activity in the trade has been the volume of shipments, rather than the volume of new orders, and the activity in shipments has been in direct relation to the general business activity of the country.

A prominent feature of the present situation, and one that has been lacking sometimes in similar general conditions in the past, is that production of steel is being closely regulated to shipments, so that there is no accumulation of pig iron, unfinished steel, or finished pro-

ducts by the steel mills, so that their blast-furnace operations are an accurate index to their shipments. Thus the Steel Corporation, which was operating 67 per cent. of its blast furnace capacity Oct. 1, and 63 per cent. on Nov. 1 is now operating about 55 per cent., its finished steel shipments being a slightly larger percentage of its capacity, as the latter falls short of the pig-iron capacity. On the whole the independents are probably running at between 60 and 65 per cent. of capacity, with prospects of a further decrease.

Prices of bars, plates and shapes are being fairly well held. Bars are being shaded $1 a ton by Chicago district independents, and plates by the same amount by two or three Ohio and Western Pennsylvania independents. There are rumors of occasional shading in wire products and merchant pipe.

Pig Iron—The basic average for November is announced at $13,363, Valley, against $13.15 in October. The advance is attributable to the number of sales in the month for forward delivery, which commanded higher prices than prompt. The official bessemer average is announced at $14.94, Valley, against $15 in October and a present market of $15. The local pig-iron market has been very quiet. Bessemer has been held at $15, Valley, although there is a rumor of a small sale at a few cents under this figure. Not enough inquiry for basic has developed to make a market. It is claimed that $13.10, Valley, can be done for prompt, but furnaces assert that the lowest asking price is $13.50. Foundry iron has sold at $13.75 and $14, Valley, depending on tonnage and delivery. It is rumored that an important interest has started to cut the $13.75 price in order to book up.

Ferromanganese—The market continues quiet; $38.50, Baltimore, with $1.95 freight to Pittsburg, is the usual asking price; but this price can usually be shaded.

Steel—The mills continue to quote $23 on bessemer billets and $24.50 on bessemer sheet bars, Pittsburg, plus full freight to destination. There are rumors of cutting in this line. Open-hearth steel is nominally about the same as bessemer but attractive orders would probably go at about 50c. less, particularly for sheet bars. Rods are easier, it being possible to do $28, Pittsburg. Some low prices on forging billets are being made by mills removed from Pittsburg, the Pittsburg price being quotable at about $28 per ton.

Sheets—James A. Campbell, president of the Youngstown Sheet & Tube Company and chairman of the sheet branch in the American Iron and Steel Institute, has called a general meeting of sheet producers to be held at Pittsburg, Dec. 8, to consider price cutting and possible remedies. While many of the mills have been cutting, three or four mills have taken the lead and the success of a movement for better conditions is held to depend largely upon their coöperation. We quote black sheets at 2.15c. and galvanized at 3.20c., these prices being shaded on attractive business, but held fairly well on carload orders. Corrugated sheets are $1.55 per square for painted and $2.75 for galvanized. These prices are 5c. per square lower than the nominal quotations which it has been sought to maintain.

St. Louis

Dec. 5—The demand for pig iron has fallen off slightly. A few inquiries have been received but orders have been light. The price of $11.50 per ton f.o.b. Birmingham or $15.25 per ton f.o.b. St. Louis is prevailing although it is rumored that this price is being shaded 25c. per ton in a few instances.

FOREIGN IRON TRADE

British Foreign Trade—Exports and imports of iron and of machinery in Great Britain, ten months ended Oct. 31, are valued by the Board of Trade returns as below:

	Exports.	Imports.	Excess.
Iron and steel	£35,671,452	£ 7,297,640	Ex. £28,373,812
Cutlery and hardware	5,264,861	1,043,101	Ex. 4,221,760
Machinery	24,185,350	3,698,431	Ex. 20,486,919
New ships	8,044,529	.....	Ex. 8,044,529
Total	£73,166,192	£12,039,172	Ex. £61,127,020
Total, 1909	64,458,617	11,347,796	Ex. 53,110,821

Increase in exports, £8,707,575, or 13.5 per cent. Increase in imports, £691,376, or 6.1 per cent. The quantities of iron and steel reported were, in long tons:

	1909.	1910.	Changes.
Imports	3,466,111	3,829,399	I. 363,288
Exports	982,423	1,092,587	I. 110,164

The imports were largely of crude or semi-finished material, as pig iron, billets and blooms.

METAL MARKETS

New York, Dec. 7—The pessimism to which reference was made last week has not passed over, and the metal markets generally have been inclined to be quiet.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Oct. 1910	$ 750,330	$ 4,247,259	Imp. $ 3,496,929
" 1909	9,379,402	7,034,164	Exp. 2,345,238
Year 1910	56,068,411	49,929,386	" 6,139,025
" 1909	106,652,236	38,139,557	" 68,512,679
Silver:			
Oct. 1910	4,269,575	3,395,200	Exp. 874,375
" 1909	4,053,745	4,048,669	" 5,076
Year 1910	46,034,318	36,652,464	" 9,381,854
" 1909	47,342,861	37,289,199	" 10,053,662

Exports from the port of New York, week ended Dec. 3: Gold, $75,400, chiefly to Panama; silver, $669,913, to London and Paris. Imports: Gold, $164,441; silver, $88,014, from Mexico, Central and South America, Australia and Japan.

Gold—The price of gold on the open market in London is unchanged at 77s. 9d. per oz. for bars and 76s. 4½d. per oz. for American coin. There was some demand from Berlin, but most of the supplies were held in London.

Platinum—The market remains rather dull, demand from the jewelry trade having fallen off. Prices are a shade lower, dealers asking $39 per oz. for refined platinum and $41 per oz. for hard metal, 10 per cent. iridium.

Silver—The market shows a slight disposition to decline to lower prices. The situation, however, depends upon China, the exchanges there at present being somewhat unsettled.

SILVER AND STERLING EXCHANGE

Dec.	1	2	3	5	6	7
New York	55	55	55	54⅞	54¼	54⅛
London	25 3/16	25 3/16	25 1/16	25 1/16	25 1/16	25
Sterling Ex.	4.8590	4.8590	4.8600	4.8605	4.8575	4.8550

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, as reported by Messrs. Pixley & Abell, Jan. 1 to Nov. 24:

	1909.	1910.	Changes.
India	£5,858,500	£6,213,000	I. £ 354,500
China	1,829,300	1,328,500	D. 500,800
Straits	114,614	.....	D. 114,614
Total	£7,802,414	£7,541,500	D. £ 260,914

India Council bills in London brought an average of 14.06d. per rupee for the week.

Copper, Tin, Lead and Zinc

NEW YORK

Dec.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. New York, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
1	12 7/8 @13	12.65 @12.70	37 1/16	4.50	4.35 @4.37½	5.87½ @5.92½	5.72½ @5.77½
2	12¾ @13	12.65 @12.70	38	4.50	4.35 @4.37½	5.85 @5.90	5.70 @5.75
3	12¾ @13	12.60 @12.70	37¾	4.50	4.35 @4.37½	5.85 @5.87½	5.70 @5.72½
5	12¾ @13	12.60 @12.70	37⅛	4.50	4.35 @4.37½	5.82½ @5.87½	5.67½ @5.72½
6	12¾ @13	12.60 @12.65	37¼	4.50	4.35 @4.37½	5 82½ @5.85	5.67½ @5.70
7	12¾ @13	12.60 @12 65	38	4.50	4.35 @4.37½	5.82½ @5.85	5.67½ @5.70

The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—During the week of Dec. 1 to 7, very little business was done. In spite of the pessimism so much in evidence generally, leading selling interests maintain their confidence and continue to

LONDON

Dec.	Copper. Spot.	Copper. 3 Mos	Copper. Best Sel'td	Tin. Spot.	Tin. 3 Mos	Lead, Spanish.	Zinc, Ordinaries.
1	57 1/16	57 3/8	61	172 3/8	172 1/2	13 3/8	24
2	57 3/8	57 15/16	61	172 3/4	172 3/8	13 1/8	24
3	.....	.....	.....	.....	.....	.....	.....
5	56 15/16	57 3/4	61	170 3/8	171	13 1/8	24
6	57 1/16	57 3/8	61	171 3/8	171 3/8	13 1/8	24
7	56 13/16	57 5/8	60 3/4	172 1/4	172 1/4	13 3/16	24 1/8

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £12 = 2.61c.; £23 = 5c.; £60 = 13.04c. ± £1 = ± 0.21¾c.

ask 13c., delivered, 30 days for their electrolytic copper. Inasmuch as buyers have been unwilling to pay that price, the market has been in hands of dealers and certain producing interests who have been ready to make the concessions necessary to consummate the relatively small business offered, under which conditions prices have slid off a little. Offers of Lake copper at 13c. have failed to attract business, while electrolytic has been offered and sold at 12.80@12.85c., delivered, both in Europe and America, the bulk of the business transacted having been for export. Producers are generally busy with deliveries on contracts made some time ago and there has been no pressure on their part to sell. At the close, Lake copper is quoted at 12¾@13c., and electrolytic in cakes, wirebars and ingots at 12.60@12.65c. Casting copper is quoted nominally at 12⅜@12½ cents.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire, is 14½c. base, carload lots at mill.

The London market for standard copper has fluctuated within narrow limits, and closes slightly lower at £56 16s. 3d. for spot, and £57 12s. 6d. for three months.

Exports of copper from New York for the week were 4730 long tons. Our special correspondent reports exports from Baltimore for the week at 1550 tons.

Brass Prices—On Dec. 5 brass prices, base, were advanced from ⅛ to ¼c. and are now as follows: High sheet brass, 14¾c. per lb.; low sheet, 16⅛c.; high brass wire, 14¾c.; low brass wire, 16⅛c.; high brass rods, 14¾c.; low brass rods, 16⅞s.; brass tubing, brazed, 19⅝c., and open seam, 17⅝c. Scrap allowances are 9¼c., net, per lb. for high brass, and 10⅛c. for low brass scrap.

Tin—American statistics published by the New York Metal Exchange on Dec. 1 were good beyond all expectations, showing deliveries of 3800 tons into consumption during November. These facts instilled dealers with a good deal of confidence in the future of the market, and in consequence fair-sized orders were placed by them in London. The market over there continued its advance, and although it reacted at the beginning of this week, it closes very firm at £172 5s. for spot and three months. New York quotations are about 38c. per pound.

Lead—Business has continued to be done at previous prices, but there has been a slightly stronger feeling, resulting from what is characterized as "nibbling." The market closes at 4.50c. New York, and 4.35@4.37½c. St. Louis.

The foreign market is quiet, Spanish lead being quoted at £13 3s. 9d., and English at £13 6s. 3d. per ton.

Spelter—Substantially the same condition has ruled in this market as in copper. Most of the producers are confident of the intrinsic strength of the market and consequently are reserved about offering the metal down. Business done during the last week has been very light and has been done at concessions in price, largely for second-hand lots. The market closes at 5.67½@5.70c. St. Louis, and 5.82½@5.85c. New York.

The London market is unchanged at £24 2s. 6d. for good ordinaries, and £24 7s. 6d. for specials.

Base price of zinc sheets is $7.75 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Silesian Spelter Market—Paul Speier writes from Breslau, Nov. 28, that the market is steady and firm. Spelter is quoted at around 49 marks per 100 kg.—equal to 5.29c. per lb.—f.o.b. works in Silesia; special brands, 50 marks. Zinc sheets are 57 marks per 100 kg.—equal to 6.15c. per lb.—f.o.b. works, for ordinary numbers. Zinc dust is in demand and brings 44.50 marks per 100 kg.—4.8c. per lb.—in 10-ton lots, delivered at Stettin.

Other Metals

Aluminum—There is little change, the market remaining dull. We quote, nominally, 22½@23c. per lb. for No. 1 ingots, New York.

Antimony—The market is dull, business being chiefly of a retail order. Cookson's is now quoted at 7⅝@7¾c. per lb. and U. S. at 7⅜@7½c.; while 7@7⅛c. is named for outside brands.

Quicksilver—The New York price has been reduced $1.50 and is now $42 per flask of 75 lb. for large lots; $44@45 for jobbing orders. San Francisco, $41.50 for domestic business and $2 less for export. London prices is unchanged at £8 per flask; £7 10s.@£7 15s. being quoted by second hands.

Cadmium—Current quotations are 60@70c. per lb. in 100-lb. lots, f.o.b. New York, according to quantity of metal.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Nickel—Large lots, contract business 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The high price of electrolytic is 5c. higher.

Imports and Exports of Metals

Exports and imports of metal in the United States, 10 months ended Oct. 31, are reported as follows, in the measures usual in the trade:

Metals:	Exports.	Imports.	Excess.
Copper, long tons	248,908	124,800	Exp. 124,108
Copper, 1909....	257,801	112,168	Exp. 145,633
Tin, long tons....	574	40,509	Imp. 39,935
Tin, 1909.....	369	36,952	Imp. 36,583
Lead, short tons.	58,943	89,007	Imp. 30,064
Lead, 1909.....	76,732	92,115	Imp. 15,383
Spelter, sh. tons.	2,646	2,952	Imp. 346
Spelter, 1909....	2,325	8,089	Imp. 5,764
Nickel, lb.....	11,844,187	26,703,630	Imp. 14,859,443
Nickel, 1909....	9,597,003	16,974,125	Imp. 7,377,122
Antimony, lb.....	185,237	8,493,504	Imp. 8,308,267
Antimony, 1909.	6,648	7,860,889	Imp. 7,854,241
Platinum, oz.....	.....	101,521	Imp. 101,521
Platinum, 1909.	.....	98,161	Imp. 98,161
Aluminum, value	$702,687	.....	Exp. $702,687
Aluminum, 1909	454,733	.....	Exp. 454,733
Ores, etc.:			
Zinc oxide, lb. ..	21,769,676	.....	Exp. 21,769,676
Zinc oxide, '09..	23,610,252	.....	Exp. 23,610,252
Zinc dross, lb....	8,165,112	.....	Exp. 8,165,112
Zinc dross, '09..	13,424,440	.....	Exp. 13,424,440
Zinc ores, lg. tons	15,590	63,304	Imp. 47,714
Zinc ores, 1909.	11,121	88,219	Imp. 77,098
Antim'y ores, lb.	.....	.....	.....
Ant. ores, 1909.	504	3,386,708	Imp. 3,386,204
Chrome ore, tons	30	38,559	Imp. 38,529
Chrome ore, '09	30	32,613	Imp. 32,583

Copper, lead and nickel (and antimony from Aug. 5, 1909) include the metal contents of ores, matte, bullion, etc. The exports given include reëxports of foreign material. Zinc contents of ore imported in 1910 were 44,367,994 lb.; not reported prior to date of new tariff. Quantity of antimony ore is not reported from Aug. 5, 1909, only metal contents being given. Imports of aluminum are not reported.

Zinc and Lead Ore Markets

Platteville, Wis., Dec. 3—The highest price paid this week for zinc ore was $48; the base price, 60 per cent. zinc, was $46@47. The highest price paid for lead ore was $56; the base price, 80 per cent. lead, was $53@54 per ton.

SHIPMENTS, WEEK ENDED DEC. 3.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point.....	896,610	.....	.....
Platteville.....	866,400	32,600	281,700
Harker	442,474	.....	.....
Benton.....	316,970	254,720	.....
Galena.....	258,000	.....	.....
Highland.....	241,500	219,500	.....
Dodgeville.....	220,000	.....	.....
Cuba City.....	164,225	78,290	.....
Livingston.....	75,000	.....	.....
Montfort.....	.....	80,870	.....
Linden.....	.....	.....	118,000
Total.....	3,481,179	665,980	399,700
Year to date.....	111,853,964	10,048,044	24,563,680

Shipped to separating plants, 2,982,040 lb. zinc ore during the week.

Joplin, Mo., Dec. 3—The highest price paid for zinc sulphide ore this week was $50.85, on a base price of $47 per ton of 60 per cent. zinc. Zinc silicate ore sold on a base price of $24@27 per ton of 40 per cent. zinc. The average price, all grades of zinc ore, was $41.98. The highest price paid for lead ore this week was $57, and the average price, all grades, was $55.82 per ton.

The zinc market took a slump this week of $1 per ton on the high-grade ores, and the low grades even more, and today prices are weaker. With this week came the first winter weather, and as usual the mines using gas were forced to shut down, as the supply was short of the demand. Many of the mines will begin at once to take out the gas and return to coal and in some cases to fuel oil. There was a big shipment of silicate ores this week, causing the average price to fall considerably under last week.

SHIPMENTS, WEEK ENDED DEC. 3.

	Zinc lb.	Lead lb.	Value.
Webb City-Carterville	5,130,820	1,125,180	$146,948
Joplin	1,542,530	286,000	43,485
Galena	1,157,420	42,000	26,597
Granby	1,147,980	3,550	17,410
Duenweg	641 210	6,630	13,862
Alba-Neck	511,000	.....	12,519
Miami	378,560	152,970	9,961
Aurora	378,700	.....	7,013
Spurgeon	439,790	41,180	6,388
Oronogo	78,080	65,010	3,412
Carthage	140,490	.....	3,161
Badger	123,760	.....	2,722
Jackson	118,730	.....	2,671
Seneca	.....	80,250	2,206
Cave Springs	58,640	.....	1,290
Sarcoxie	64,090	.....	768
Totals	11,911,800	1,802,770	$300,413
49 weeks	552,004,170	78,136,440	$13,035,721

Zinc value, the week, $250,037; 49 weeks, $11,000,936
Lead value, the week, 50,326; 49 weeks, 2,035,085

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	43.60	34.71	39.71	50.82	51.26
April	38.63	41.00	37.01	39.33	55.63	49.72
May	40.06	40.19	37.42	37.51	56.59	48.16
June	44.15	40.20	40.35	37.83	57.52	48.80
July	43.06	39.63	41.11	36.80	53.74	48.59
August	48.25	40.13	44.54	37.32	57.60	49.75
September	47.70	43.45	44.87	39.96	56.11	54.73
October	49.50	43.31	45.75	40.50	55.02	53.18
November	51.31	47.20	48.29	43.20	53.94	54.80
December	49.45	.....	47.57	.....	55.26	.....
Year	$43.98	.....	$41.20	.....	$54.60	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, Dec. 7—The general market continues quiet, with only moderate business.

Copper Sulphate—With a fair business prices are firm at $4 per 100 lb. in carload lots and $4.25 per 100 lb. on smaller transactions.

Exports of copper sulphate, 10 months ended Oct. 31, were 975 long tons in 1909, and 1669 in 1910; increase, 694 tons.

Arsenic—Prices for white arsenic remain nominally $2.25 per 100 lb.; but some shading is reported to be going on.

Nitrate of Soda—Both spot and future nitrate are quoted at 2.12½c. per lb. The market is dull.

Imports and Exports—Imports and exports of chemicals and raw materials in the United States, 10 months ended Oct. 31:

	Imports.	Exports.	Excess.
Bleach, lb	81,273,630	496 I.	81,273,134
Bleach, 1909	73,023,928	13,964 I.	73,009,964
Potash salts, lb.	427,997,126	2,100,131 I.	425,896,995
Potash salts, '09	317,907,275	2,375,014 I.	315,532,261
Soda salts, lb	28,626,805	426,007 I.	28,200,798
Soda salts, 1909	12,883,902	594,293 I.	12,289,609
Acetate lime, lb.	.....	53,961,416 E.	53,961,416
Acetate, 1909	.....	59,767,732 E.	59,767,732
Nit. of soda, tons	443,605	5,212 I.	438,393
Nitrate, 1909	330,498	7,999 I.	322,499
Phosphates, tons	10,277	902,809 E.	892,532
Phosphates, '09	6,077	897,709 E.	891,632
Sulphur, tons	26,226	28,698 E.	2,472
Sulphur, 1909	23,813	31,902 E.	8,089
Pyrites, tons	658,151	..... I.	658,151
Pyrites, 1909	585,319	..... I.	585,319
Magnesite, lb.	221,762,331	3,326,662 I.	218,435,669
Magnesite, 1909	58,517,783	573,105 I.	57,944,678
Sul. Ammonia, lb.	139,005,043	..... I.	139,005,043
Sul. Am'nia, '09	62,583,604	..... I.	62,583,604

Exports include reëxports of foreign material. Figures for magnesite not reported prior to July 1, 1909; imports above for 1909 are for four months only. Estimating sulphur contents of pyrites, the total imports of sulphur in 1910 were 289,766 tons.

MINING STOCKS $

New York, Dec. 7—The general stock market has been dull and heavy for most of the week. Business has been slow and quotations inclined toward a lower level. The market is irregular and there seems to be no definite tendency.

On the Curb also business was dull and irregular. Cobalt stocks were out of the running altogether. Dealings in the copper stocks were of fair amount; Ray Consolidated and Greene Cananea held their quotations, but most of the others lost in price. Standard Oil was dealt in to some extent, and lost in price, closing at $611 per share.

In November the following companies were admitted to quotation on the New York Curb: Nevada Hills Mining Company; Radersburg Consolidated Mining Company; United States Coal Manufacturing Company; Guanajuato Mining and Milling Company (bonds and stock). The following were suspended, Wilkes-Barre Company; Canadian Mines Company.

Boston, Dec. 6—Copper shares have followed the course of the general market largely, but the fiasco in Utah Consolidated has been a big factor in discrediting this class of securities. This, following the North Butte, Calumet & Arizona, Granby and Arizona Commercial breaks of recent date, has done much to undermine public sentiment and drive people out of their copper-share holdings.

Utah Consolidated broke from above $20 to $12.25 upon the announcement of President Broughton as to the ore reserves.

Naturally, the whole list suffered declines. It was not so much a matter of offerings as it has been of lack of sup-

COPPER PRODUCTION REPORTS.
Copper contents of blister copper, in pounds.

Company.	September.	October.	November.
Anaconda	22,200,000	22,100,000	21,900,000
Arizona, Ltd	2,672,000	3,004,000	.....
Balaklala	*nil*	928,360	.....
Boleo (Mexico)	2,061,300	2,278,454	.....
British Col. Co	622,702	702,154	.....
Copper Queen	6,903,759	7,060,796	7,372,776
Calumet & Ariz	2,535,000	1,990,000	.....
Cananea (Mexico)	3,565,000	3,576,000	3,658,000
Detroit	2,128,000	1,757,836	1,840,939
East Butte	625,840	948,369	.....
Granby	.....	1,184,234	.....
Imperial	*nil*	*nil*	.....
Mammoth	.....	.....	.....
Moctezuma (Mex.)	2,211,435	1,791,108	1,654,235
Nevada Con	5,151,208	4,980,300	.....
Old Dominion	2,262,000	2,345,000	.....
Shannon	1,418,000	1,286,000	1,420,000
Superior & Pitts	2,125,000	2,095,000	.....
Utah Copper Co	7,077,035	7,582,219	.....
Lake Superior	16,700,000	18,500,000	.....
Total production.	80,251,273	84,109,830	.....
Imports, bars, etc.	24,303,859	24,292,368	.....
Total blister	104,555,132	108,402,198	.....
Deduct Mex. & B. C.	8,460,037	8,347,716	.....
Net blister rep.	96,094,695	100,054,482	.....
Imp. in ore & matte	5,782,067	5,173,277	.....
Total	101,876,762	105,227,759	.....

Lake Superior figures are estimated; others are reports received from companies. Imports duplicate production of British Columbia, Cananea and Moctezuma. Boleo copper does not come to American refiners. Utah Copper report includes the output of the Boston mill.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
XII, 1909	117,828,655	69,519,501	59,546,570
Year, 1909	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,493	66,618,322	37,369,518
III	120,067,467	62,844,818	40,585,767
IV	117,477,639	67,985,951	31.332,434
V	123,242,476	59,305,222	45,495,400
VI	127,219,188	53,363,196	65,895,948
VII	118,370,003	56,708,175	59,407,167
VIII	127,803,618	67,731,271	61,831,780
IX	119,519,983	64,501,018	75,106,496
X	126,469,284	67,814,172	68,186,912
XI	.....	.....	.....

	Visible Stocks. United States.	Europe.	Total.
XII, 1909	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,800	346,700,139
III	107,187,992	254,150,400	361,338,392
IV	123,824,874	249,625,600	373,450,474
V	141,984,159	246,870,400	388,854,559
VI	160,425,973	239,142,400	399,568,373
VII	168,386,017	232,892,800	401,278,817
VIII	170,640,678	222,320,000	392,960,678
IX	168,881,245	218,444,800	387,326,045
X	148,793,714	211,276,800	360,070,514
XI	139,261,914	198,060,800	337,322,714
XI	.....	193,200,000	.....

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

port. Calumet & Hecla is back to $535 per share after the recent high at $600. Wolverine broke $10 or more, while such stocks as North Butte, Calumet & Arizona and some of the Calumet & Hecla allies worked materially lower. East Butte stood its ground well, although it suffered in the general weakness.

Today's market put prices to even lower levels. A resumption of dividends by the Granby Consolidated did not stay a decline of this stock, not to speak of the balance of the other list. After a year's lapse Granby directors have declared a dividend of $1 per share. Calumet & Arizona directors have declared a quarterly dividend of $1, and Old Dominion the regularly quarterly 25c. dividend. Curb prices have followed the general trend of the big market. Chino received its share of setback.

Assessments

Company.	Delinq.	Sale.	Amt.
Amador C. & G., Ida	Dec. 15	Jan. 15	$0.01
Beck Tunnel, Utah	Dec. 13	Jan. 6	0.01
Bonanza Mt. Copper, Ida	Nov. 18	Dec. 17	0.001
Cedar Creek, Ida	Nov. 14	Dec. 14	0.004
Chollar, Nev	Dec. 5	Dec. 30	0.10
Copper King, Ida	Dec. 16	Jan. 16	0.01
Ely Central, Nev	Dec. 15		0.10
Florence M. & M., Ida	Feb. 20	Mar. 20	0.001
Gold Mt. Champion, Utah	Dec. 1	Dec. 19	0.00½
Gould & Curry, Nev		Dec. 27	0.10
Horseshoe, Ida	Dec. 10	Jan. 10	0.002
Ibex, Ida	Dec. 17	Jan. 17	0.002
Ida. Copper M. Ltd., Ida	Nov. 22	Dec. 22	0.003
Keystone, Utah	Dec. 15	Jan. 17	0.05
Little North Fork, Ida	Nov. 15	Dec. 31	0.004
Lucky Swede G. & C., Ida	Dec. 1	Dec. 31	0.001
Mex. Con. M. & M	Nov. 15	Dec. 15	1.00
Mineral Farm, Ida	Nov. 12	Dec. 17	0.003
Missoula Copper, Ida	Dec. 12	Dec. 31	0.01
North Franklin, Ida	Dec. 15	Jan. 16	0.005
North Star, Ida	Nov. 28	Dec. 20	0.001
Silver Queen, Utah	Dec. 15	Jan. 10	0.004
Trans.-Cont. S. & C., Ida	Nov. 24	Dec. 15	0.002
Uintah-Treas. Hill, Utah	Dec. 12	Jan. 6	0.01
Vienna Vein, Ida	Dec. 15	Jan. 16	0.001

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	51.454	23.227	23.690
April	51.428	53.221	23.708	24.483
May	52.905	53.870	24.343	24.797
June	52.538	53.462	24.166	24.651
July	51.043	54.150	23.519	25.034
August	51.125	52.912	23.588	24.428
September	51.440	53.295	23.743	24.567
October	50 923	55.490	23.502	25.596
November	50.703	55.635	23.351	25.680
December	52.226	.....	24.030	.....
Total	51.502	.....	23.706	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER.

	New York.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13.893	13.620	14.280	13.870	61.198	60.923
February	12.949	13.332	13.295	13.719	57.688	59.388
March	12.387	13.255	12.826	13.586	56.231	59.214
April	12.56½	12.733	12.93¾	13.091	57.363	57.238
May	12.893	12.550	13.238	12.885	59.338	56.313
June	13.214	12.404	13.548	12.798	59.627	55.310
July	12.880	12.215	13.363	12.570	58.556	54.194
August	13.007	12.490	13.296	12.715	59.393	55.733
September	12.870	12.379	13.210	12.668	59.021	55.207
October	12.700	12.553	13.030	12.788	57.551	56.722
November	13.125	12.742	13.354	12.914	58.917	57.634
December	13.298	.....	13.647	.....	59.906	.....
Year	12.982	.....	13.335	.....	58.732	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	28.060	32.700	July	29.125	32.695
February	28.290	32.920	August	29.966	33.972
March	28.727	32.403	September	30.293	34.982
April	29.445	32.976	October	30.475	36.190
May	29.225	33.125	November	30.859	36.547
June	29.322	32.769	December	32.913	.....
			Av Year	29.725	.....

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	4.459	3.835	4.307	13.438	13.063
April	4.168	4.376	4.051	4.225	13.297	12.641
May	4.287	4.315	4.214	4.164	13.225	12.550
June	4.350	4.343	4.291	4.207	13.031	12.688
July	4.321	4.404	4.188	4.291	12.563	12.531
August	4.363	4.400	4.227	4.290	12.475	12.513
September	4.342	4.400	4.215	4.289	12.781	12.582
October	4.341	4.400	4.215	4.271	13.175	13.091
November	4.370	4.442	4.252	4.314	13.047	13.217
December	4.560	.....	4.459	.....	13.125	.....
Year	4.273	.....	4.153	.....	13.049	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.562	23.188
March	4.757	5.637	4.607	5.487	21.438	23.031
April	4.965	5.439	4.815	5.289	21.531	22.469
May	5.124	5.191	4.974	5.041	21.975	22.100
June	5.402	5.128	5.252	4.978	22.000	22.094
July	5.402	5.152	5.252	5.002	21.969	22.406
August	5.729	5.279	5.579	5.129	22.125	22.800
September	5.796	5.514	5.646	5.364	22.906	23.165
October	6.199	5.628	6.043	5.478	23.200	23.900
November	6.381	5.976	6.231	5.826	23.188	24.083
December	6.249	.....	6.099	.....	23.094	.....
Year	5.503	.....	5.352	.....	22.201	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	18.53	15.84	16.93	15.62	17.00
April	15.79	18.28	15.05	16.84	15.06	16.75
May	15.77	17.10	15.02	15.94	15.08	16.18
June	16.13	16.52	15.84	15.60	15.63	15.53
July	16.40	16.40	15.90	15.40	15.96	15.40
August	17.16	16.09	16.17	14.89	16.20	15.16
September	18.44	15.92	16.80	14.73	17.03	14.93
October	19.75	15.90	17.84	14.05	18.02	14.88
November	19.90	15.84	18.37	14.26	18.09	14.78
December	19.90	.....	18.15	.....	17.90	.....
Year	$17.46	.....	$16.46	.....	$16.40	.....

STOCK QUOTATIONS

COLO. SPRINGS Dec. 6

Name of Comp.	Bid.
Acacia	.05
Cripple Cr'k Con.	.02½
C. K. & N.	.15
Doctor Jack Pot	.09
Elkton Con	.75
El Paso	.88
Fannie Rawlins	‡.05
Findlay	.07
Gold Dollar	‡.13
Gold Sovereign	.03½
Isabella	.18½
Jennie Semple	.10½
Lexington	.03
Moon Anchor	‡.02
Old Gold	‡.04
Mary McKinney	‡.49
Pharmacist	.02½
Portland	1.05
Vindicator	.91
Work	‡.03

SALT LAKE Dec. 6

Name of Comp.	Bid.
Bingham Copper	‡.15
Carisa	.11½
Colorado Mining	.45
Columbus Con	.20
Daly Judge	‡4.25
Grand Central	.77
Iron Blossom	.74
Little Bell	1.00
Little Chief	‡.22
Lower Mammoth	.09
Mason Valley	9.25
Maj. Mines	‡.53
May Day	.11
Nevada Hills	2.15
New York	‡.13
Prince Con	.78
Silver King Coal'n	1.60
Sioux Con	.29
Uncle Sam	.54
Victoria	‡1.07½

SAN FRANCISCO. Dec. 6.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Alta	‡.05
Belcher	.37
Best & Belcher	.15
Caledonia	.17
Challenge Con	.08
Chollar	.12
Confidence	.70
Con. Cal. & Va	.80
Crown Point	.35
Gould & Curry	.12
Hale & Norcross	.11
Mexican	.79
Occidental	.42
Ophir	1.05
Overman	.28
Potosi	‡.30
Savage	.09
Sierra Nevada	.12
Union Con	.17
Yellow Jacket	.24

Name of Comp.	Bid.
MISC. NEV. & CAL.	
Belmont	4.42½
Jim Butler	.25
MacNamara	.20
Midway	.18
Mont.-Tonopah	.90
North Star	.04
West End Con	.59
Atlanta	.13
Booth	.07
C.O.D. Con	.07
Comb. Frac	.15
Jumbo Extension	.23
Oro	.05
Red Hill	.02
Silver Pick	.06
St. Ives	‡.14
Tramps Con	.02
Argonaut	‡1.20
Cent. Eureka	‡.75
So. Eureka	‡5.90

N. Y. EXCH. Dec. 6

Name of Comp.	Clg.
Amalgamated	61⅝
Am. Agri. Chem	42¼
Am.Sm.&Ref.,com	71⅞
Am. Sm. & Ref., pf.	103¾
Anaconda	38⅞
BethlehemSteel pf	58
Col. & Hock. C. & I.	‡6
Federal M. & S., pf.	‡58
Goldfield Con	8⅜
Great Nor., ore ctf.	54½
Homestake	‡85
Nat'nalLead,com.	50¼
National Lead, pf.	‡104
Nev. Consol	18⅝
Pittsburg Coal	17¼
RepublicI&S,com.	30¾
Republic I & S, pf.	93⅛
SlossSheffil'd,com.	49
Sloss Sheffield, pf.	114½
Tennessee Copper	34½
Utah Copper	45
U. S. Steel, com	71¼
U. S. Steel, pf	115¼
Va. Car. Chem	59½

BOSTON EXCH. Dec. 6

Name of Comp.	Clg.
Adventure	6½
Algomah	9
Allouez	37½
Am. Zinc	26
Arcadian	4
Arizona Com	13¼
Atlantic	6
Bonanza	‡.50
Boston & Corbin	13¼
Butte & Balak	6¾
Calumet & Ariz	50
Calumet & Hecla	535
Centennial	15
Con. Mercur	‡6
Copper Range	65½
Daly-West	‡3½
East Butte	11⅛
Franklin	10
Granby	36
Hancock	21
Helvetia	‡2
Indiana	12
Isle Royale	17
Keweenaw	3
Lake	30½
La Salle	7½
Mass	‡9
Michigan	3½
Mohawk	‡48
Nevada	18¾
North Butte	28
North Lake	6¾
Ojibway	‡8
Old Dominion	36¾
Osceola	‡129
Parrot	‡13
Quincy	‡75
Shannon	11
Superior	40
Superior & Bost	6
Superior & Pitts	13⅛
Tamarack	‡58
Trinity	5
U. S. Mining	30½
U. S. Mining, pf	45¾
Utah Apex	2⅝
Utah Con	13
Victoria	2½
Winona	8¾
Wolverine	118
Wyandot	1¼

N. Y. CURB Dec. 6

Name of Comp.	Clg.
Ariz.-Cananea	31
Barnes King	‡16
Bonanza Creek	‡3
Braden Copper	4¼
B. C. Copper	6⅜
Buffalo Mines	‡2
Butte Coalition	17⅝
Caledonia	1
Calumet & Mont.	¾
Canadian Mines	‡63⅛
Chino	22
Cobalt Central	10
Con. Ariz. Sm.	1⅛
Davis-Daly	1½
Dominion Cop	‡7
Ely Con	36
El Rayo	3¼
Florence	1⅜
Giroux	6
Greene Cananea	6⅞
Guanajuato	‡1⅝
Guerrero	‡1⅛
Guggen. Exp	195
Kerr Lake	6
La Rose	4⅝
McKinley-Dar-Sa	1.35
Miami Copper	19
Mines Co. of Am.	5
Mont. Shoshone	‡.14
Nev. Utah M. & S.	
Nipissing Mines	10¾
Ohio Copper	1⅝
Pacific Sm. & M.	
Precious Metals	1¾
Ray Central	1
Ray Con	18¾
Red Warrior	1⅝
South Utah M. & S.	1⅛
Standard Oil	612
Stewart	¾
Tonopah	8⅛
Tonopah Ex	1.07
Tri-Bullion	½
Tularosa	¾
Union Mines	
Yukon Gold	3

BOSTON CURB Dec. 6

Name of Comp.	Last.
Ahmeek	180
Bingham Mines	2½
Boston Ely	1⅛
Boswyocolo	.07
Cactus	.22
Calaveras	2.93
Champion	.03½
Chemung	‡.08½
Chief Cons	1
Cons. Ariz	1⅛
Corbin	4
Crown Reserve	2⅝
First Nat. Cop	1⅛
Inspiration	9⅛
Mackinaw	.24
Majestic	.34
Nat'l Mine & Ex	.03
Nevada-Douglas	2¾
Oneco	2
Raven Copper	.45
Rhode Island Coal	6⅞
San Antonio	‡6
Shattuck-Ariz	‡21
South Lake	6
Superior & Globe	‡10
Trethewey	1¼
Tuolumne Copper	4¾
Vulture	.08⅝
Yuma	.20

LONDON Dec. 7

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton'sInd.	0 3 3
Camp Bird	1 10 3
Esperanza	1 17 10½
Tomboy	0 18 5
El Oro	1 5 9
Oroville	0 6 0
Mexico Mines	7 0 8 0

‡Last quotation.